

EQUIPMENT: **FIRECLASS DUO-CEL**
PUBLICATION: OM_FC_DUO-CEL_APP
ISSUE No. & DATE: 0 01/03/12

WRITTEN BY: RKP
CHECKED BY: AP
APPROVED BY: JBJ



FIRECLASS

DUO-CEL

FIRE DETECTION/ALARM PANEL

Application Guide

List of Contents

1. INTRODUCTION	4	11.3 AUXILIARY SUPPLY	27
2. GENERAL DESCRIPTION.....	4	11.4 FIRE SIGNAL OUTPUT	27
2.1 CABINET SPECIFICATIONS	4	11.5 FIRE RELAY OUTPUT	27
2.1.1 Panel Order Codes & Descriptions.....	5	11.6 FAULT RELAY OUTPUT	27
2.1.2 Replacement PCB Order Codes and Descriptions	6	11.7 REMOTE CONTROL INPUT	28
2.1.3 Optional Language Display Overlays	6	11.7.1 Class Change	28
2.2 FIRE DETECTION AND ALARM PANEL DESCRIPTION.....	7	11.7.2 Alert	28
2.2.1 DUO-CEL control board.....	7	11.7.3 Evacuate.....	28
2.2.2 Display overlay and insert.....	7	11.7.4 Silence Alarms.....	28
2.2.3 Power Supply.....	8	11.7.5 Reset	28
2.2.4 Repeater Panel.....	8	11.8 OPEN COLLECTOR OUTPUTS.....	28
3. FUNCTIONAL SPECIFICATION	8	11.8.1 Disabled Output.....	29
3.1 PANEL INPUT/OUTPUT LIST	8	11.8.2 Evacuate Output.....	29
3.2 FEATURES LIST.....	9	11.8.3 Buzzer Active Output.....	29
4. DUO-CEL PANEL – CONTROL BOARD FEATURES	11	11.9 SOUNDER CIRCUITS.....	29
5. DUO-CEL REPEATER – CONTROL BOARD FEATURES	12	11.10 ELECTRICAL DESIGN OF DETECTION ZONES	29
6. POWER SUPPLY	13	11.10.1 Standard Panel Default Zone Configuration	29
6.1 GENERAL.....	13	11.10.2 Standard Panel Resistor Zone Configuration	29
6.1.1 Supply Input.....	13	11.10.3 Twin-Wire Panel	29
6.1.2 Supply Output.....	13	11.10.4 Maximum Number of Detectors/MCPs on a Zone.....	30
6.1.3 Battery Charger.....	13	11.11 PANEL TO REPEATER WIRING.....	33
6.1.4 Battery Monitoring.....	13	12. MECHANICAL & ELECTRICAL SPECIFICATION	34
6.1.5 Visual indications	14	13. ENVIRONMENTAL SPECIFICATION.....	35
6.1.6 Fault Conditions	14	14. DUO-CEL INPUT AND OUTPUT SPECIFICATION..	36
6.2 MECHANICAL PROTECTION.....	14	15. APPENDIX.....	39
6.2.1 DUO-CEL Power Supply Features and Connections	14	15.1 EN54 MANDATORY FUNCTIONS	39
7. COMPATIBLE FIELD DEVICES	15	15.2 EN54 OPTIONAL FUNCTIONS WITH REQUIREMENTS.....	39
7.1 FIELD DEVICE PART NUMBERS	15	15.3 ANCILLARY FUNCTIONS NOT REQUIRED BY EN54.....	39
8. OVERVIEW OF USER FUNCTIONS	18	15.4 SAFE STATE	39
8.1 USER INDICATIONS.....	18	15.5 POWER SUPPLY LOAD CALCULATION.....	40
8.2 USER CONTROLS	19	15.6 MINIMUM STANDBY BATTERY CAPACITY CALCULATION.....	40
8.3 SELECTION OF ZONES OR OUTPUTS FOR DISABLEMENT, ENABLEMENT OR TEST	20	15.6.1 Standby Battery Capacity Calculation Worksheet.....	42
8.4 DISABLED ZONES AND OUTPUTS.....	20	15.7 A1466 INTERFACE RELAY.....	43
8.5 DETECTOR ZONE TEST.....	20	15.8 PANEL CONFIGURATION DESIGN CHART	44
8.6 ALARM SOUNDER ONE MAN TEST	20	16. GENERAL ASSEMBLY DRAWING	45
9. OVERVIEW OF ENGINEERS FUNCTIONS	21		
9.1 ENGINEER'S CONFIGURATION PROCESS	21		
9.1.1 Zone Dependency selection	21		
9.1.2 Repeater configuration.....	21		
9.2 ZONE 1 NON-LATCH OPERATION	22		
9.3 RESISTOR EOL.....	22		
9.4 TWIN WIRE	22		
9.5 ALERT MODE	22		
9.6 SELECTABLE ZONAL OR GENERAL ALARM SOUNDER OPERATION	23		
9.7 BUZZER DISABLE	23		
9.8 EARTH FAULT MONITORING.....	23		
10. PANEL REPEATERS	23		
10.1 REPEATER USER INDICATIONS.....	24		
10.2 REPEATER USER CONTROLS	25		
11. CIRCUIT CONNECTION DETAILS.....	26		
11.1 DUO-CEL PANEL MOTHERBOARD TERMINATION DETAILS	26		
11.2 DUO-CEL REPEATER MOTHERBOARD TERMINATION DETAILS	27		

List of Figures

FIGURE 1 – PANEL/REPEATER ENCLOSURE EXTERNAL VIEW	5
FIGURE 2 – DUO-CEL 8 ZONE PANEL – EXPLODED VIEW	7
FIGURE 3 – PANEL CONTROL BOARD AND PCB COVER	11
FIGURE 4 – REPEATER CONTROL BOARD AND PCB COVER	12
FIGURE 5 – BAQ35T24 1.5A POWER SUPPLY LAYOUT	14
FIGURE 6 – DUO-CEL PANEL FIELD TERMINATIONS .	26
FIGURE 7 – DUO-CEL REPEATER FIELD TERMINATIONS	27
FIGURE 8 – FIRE SIGNAL OUTPUT CONNECTIONS	27
FIGURE 9 – RELAY CONTACT CONNECTION DETAILS ..	27
FIGURE 10 – REMOTE CONTROL I/P CONNECTIONS ..	28
FIGURE 11 – ALARM CIRCUIT CONFIGURATION	29
FIGURE 12 – TWIN-WIRE EOL DEVICE	30
FIGURE 13 – STANDARD ZONE WIRING DIAGRAM	30
FIGURE 14 – RESISTOR EOL ZONE WIRING DIAGRAM	31
FIGURE 15 – TWIN-WIRE ZONE WIRING DIAGRAM	31
FIGURE 16 – ALARM CIRCUIT WIRING DIAGRAM	32
FIGURE 17 – REMOTE INDICATORS WIRING DIAGRAM	32
FIGURE 18 – REPEATER WIRING DIAGRAM	33
FIGURE 19 – A1466 INTERFACE RELAY SPECIFICATION	43

List of Tables

TABLE 1 – PANEL INPUT/OUTPUT LIST	8
TABLE 2 – FLOAT CHARGE VOLTAGES FOR POWERSONIC VRLA BATTERIES	13
TABLE 3 – DUO-CEL PANEL DIL SWITCH CONFIGURATION DESIGN/RECORD	44
TABLE 4 – ZONE DEPENDENCY CONFIGURATION DESIGN/RECORD	44

1. Introduction

This document contains technical information necessary for application design using the **FIRECLASS DUO-CEL** Conventional Fire Detection control panel.

The following supporting documentation is also available:

- **FIRECLASS DUO-CEL** Sales Literature
- **FIRECLASS DUO-CEL** User Manual
- **FIRECLASS DUO-CEL** Installation and Commissioning Manual.
- **FIRECLASS DUO-CEL** Log Book.

Note: References are made throughout this document to “Fire Signal Output” and “Fire Relay Output”. These refer to particular outputs from the panel and are provided for specific purposes:

- Fire Relay Output: An output used to activate ancillary fire protection equipment or systems. For example, fire doors or plant shutdown.
- Fire Signal Output: An output used to send a common fire warning signal to a remote fire monitoring station.

Detailed descriptions of both outputs are provided within the following text.

The panel is currently available as a standard conventional panel, with a twin-wire version soon to be released. This document describes features available for both types of panel.

2. General Description

The **FIRECLASS DUO-CEL** Panel range is fully compliant with the mandatory requirements and selected optional requirements of EN54 parts 2 and 4.

The **FIRECLASS DUO-CEL** equipment range consists of the following:

- Standard Panels:
1, 2, 4 and 8 zone versions.
- Twin-Wire Panels:
1, 2, 4 and 8 zone versions.
- Repeater:
8 zone 24Vdc & 230Vac versions.

Each panel in the range is housed in an Acrylonitrile Butadiene Styrene (ABS) Plastic enclosure with a combined display & control board

mounted to the back box. An ABS cover is fixed over the display/control board, leaving the field terminals, configuration switches, links and user controls easily accessible.

The front cover of the enclosure clips onto the back box and is fixed by one screw on the top and two screws on the bottom.

The PCB cover is fitted with a polyester overlay providing user controls and indications. All display text is printed on the overlay, with an insert for the zone location text that slides into a pocket in the overlay.

User controls are locked & unlocked via a plastic key which is inserted through a keyhole in the cover and cannot be removed when in the ON position.

All indications are implemented using LEDs, three of which are not visible when the enclosure front is fitted.

The power supply and standby batteries are housed within the panel enclosure. The power supply is fitted underneath the PCB with the mains supply cable terminals accessible for easy installation. The batteries are fitted in the back box and retained by a plastic bar which is fixed to the back box by a single screw.

Field cable Earth shields can be terminated to a functional earth bar located in the rear of the panel enclosure.

2.1 Cabinet Specifications

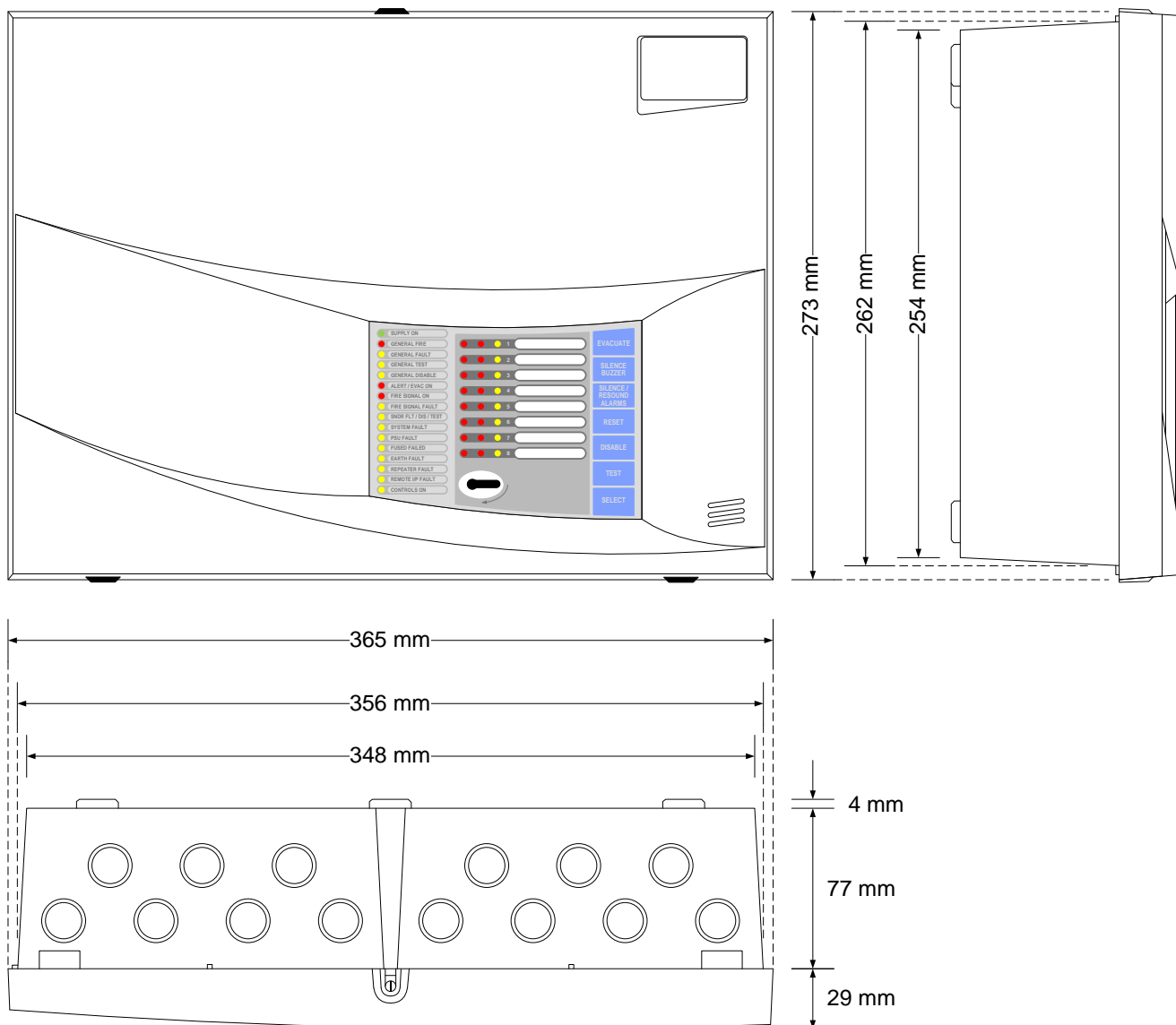
Enclosure construction:

- Three-part high quality moulded ABS plastic enclosure.
- Keyhole for access control key.
- 14 knockouts for 20mm cable glands.
- 5 mounting holes in the rear of the back box.
- Integral bezel design for surface mounting or semi-flush mounting.
- Logo recess on the top-right of the front cover.
- Ingress Protection rating – IP30

Finish:

- Fine-texture (spark finish)
- Colour – Light Grey RAL7035

Figure 1 – Panel/Repeater Enclosure external view



2.1.1 Panel Order Codes & Descriptions

CEL Part No.	Description	Internal SLA Battery (Not Supplied)
508.031.701	1 Zone Panel – Standard	24V, 3.4Ah
508.031.707	1 Zone Panel – Twin-Wire	24V, 3.4Ah
508.031.702	2 Zone Panel – Standard	24V, 3.4Ah
508.031.708	2 Zone Panel – Twin-Wire	24V, 3.4Ah
508.031.703	4 Zone Panel – Standard	24V, 3.4Ah
508.031.709	4 Zone Panel – Twin-Wire	24V, 3.4Ah
508.031.704	8 Zone Panel – Standard	24V, 3.4Ah
508.031.710	8 Zone Panel – Twin-Wire	24V, 3.4Ah
508.031.705	8 Zone Repeater c/w Mains AC Power Supply	24V, 3.4Ah
508.031.706	8 Zone Repeater – DC Powered From Panel	N/A

EQUIPMENT: **FIRECLASS DUO-CEL**

WRITTEN BY: RKP

PUBLICATION: OM_DUO-CEL_APP

CHECKED BY: AP

ISSUE No. & DATE: 0 01/03/12

2.1.2 Replacement PCB Order Codes and Descriptions

CEL Part No	Description	Used in
2605501	1 Zone standard motherboard	508.031.701
2605502	2 Zone standard motherboard	508.031.702
2605503	4 Zone standard motherboard	508.031.703
2605504	8 Zone standard motherboard	508.031.704
2605505	Repeater c/w PSE motherboard	508.031.705
2605506	Repeater no PSE motherboard	508.031.706
2605533	1 Zone twin wire motherboard	508.031.707
2605534	2 Zone twin wire motherboard	508.031.708
2605535	4 Zone twin wire motherboard	508.031.709
2605536	8 Zone twin wire motherboard	508.031.710
2501061	Spare access controls key (1 off)	All
2000843	BAQ35T24 Power supply	All except repeater with no PSE

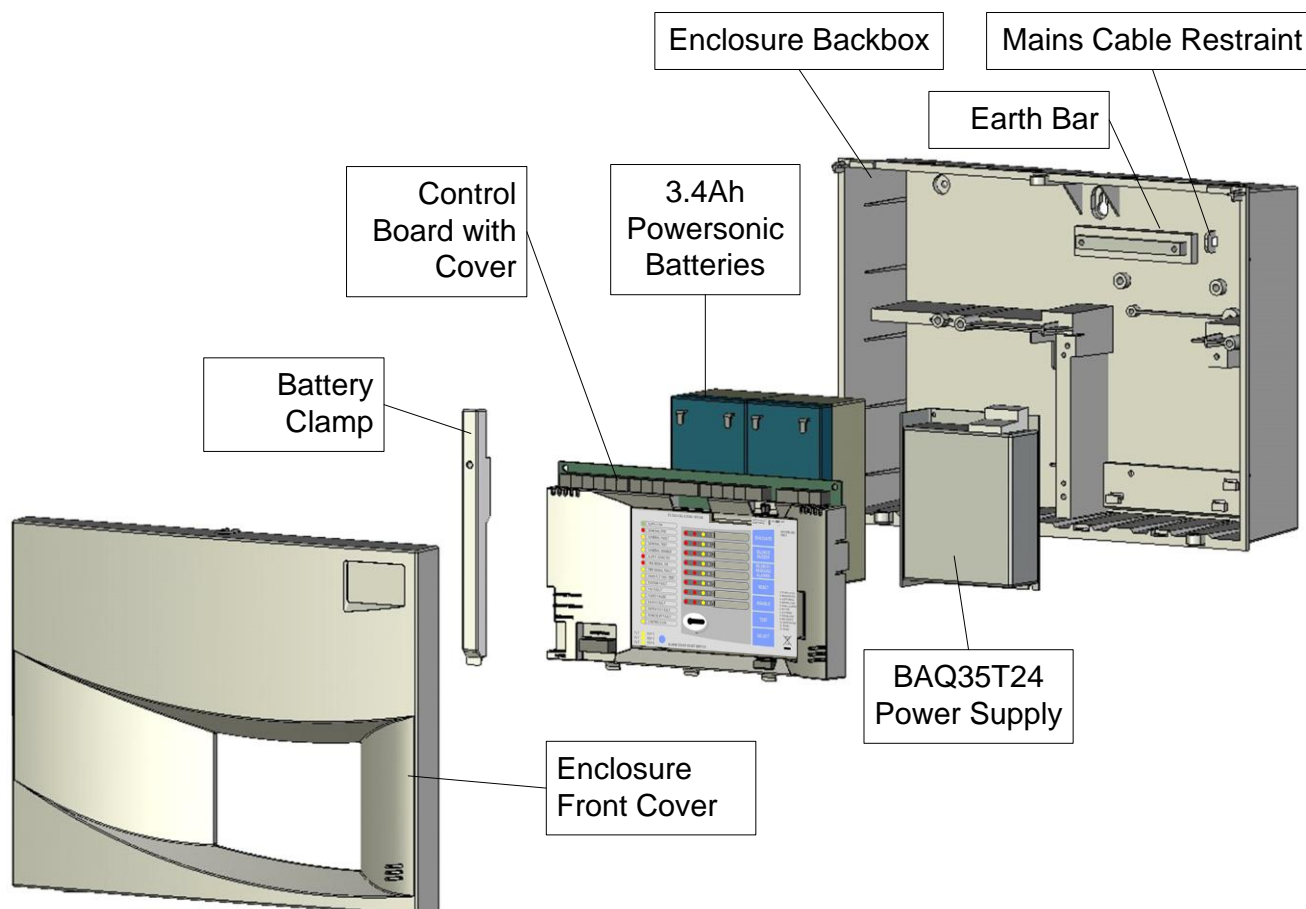
2.1.3 Optional Language Display Overlays

CEL Part No	Description
	*** None Currently Available ***

2.2 Fire Detection and Alarm Panel Description

Figure 2 shows the exploded view of the DUO-CEL panel.

Figure 2 – DUO-CEL 8 Zone Panel – exploded view



2.2.1 DUO-CEL control board

The DUO-CEL panel is available in two formats; Standard and Twin-Wire. The standard panel monitors conventional detectors on the zone circuits and operates conventional sounders via the sounder circuits. The twin-wire panel monitors conventional detectors on the zone circuits but can also operate Fulleon Twin-Wire sounders from the zone circuits. The conventional sounder circuits are still available on the twin-wire panel.

The Twin-Wire control board is slightly different to the Standard control board but this is only evident at component level. Both control boards consist of a PCB with all components mounted on the front. All LED indicators, configuration switches/links and user controls are mounted on this board. The board accommodates the microcontroller (including Firmware and RAM) and all of the site-specific configuration features (DIL switch & EEPROM).

Power supply monitoring circuitry is also located on this PCB.

2.2.2 Display overlay and insert

The display overlay is bonded to the PCB cover and is used with a text label insert to identify each of the zones. The insert slides into a pocket in the overlay and cannot be removed when the front cover is fitted.

User controls are operated by pressing on the rectangular printed buttons on the overlay, providing mechanical contact with the buttons on the PCB.

The LEDs on the PCB are viewed through oval windows in the overlay.

The text on the overlay is printed and therefore any language variants will require replacement of the complete overlay on the PCB cover.

The zone location insert is a card allowing text to be hand-written or typed. It is not compatible with printers. A paper insert can be used if printing via a computer is required (paper insert is not supplied).

2.2.3 Power Supply

The Power Supply is a self-contained switch-mode unit and is mounted underneath the control board. This unit provides 27.5VDC (nominal) at 1.5A to the control board.

The output from the PSU is temperature compensated, i.e. the battery charging voltage is automatically adjusted to the safest optimum value depending on the temperature of the batteries.

The PSU is connected to the control board by two leads:

- The output lead has a 3-way socket, providing 0V, 28V and Mains Fault signals. (The connector on the panel motherboard may have a 4th pin for Functional Earth connection from alternative power supplies).
- The Thermistor lead connects to the Thermistor socket on the control board, the Thermistor being situated on the control board. (The Thermistor is used to monitor the battery temperature).

The control board provides connections for the standby batteries via spade terminals.

The enclosure accommodates 2-off 12V 3.4Ah Sealed Lead-Acid Powersonic PS-1230 batteries.

NOTE: The battery clamp is not designed to clamp batteries other than the PS-1230.

2.2.4 Repeater Panel

The repeater panel uses the same control board and enclosure as the fire alarm panel. The components for the redundant circuits [zones, alarm circuits etc] are not present on the repeater control board. The repeater and fire panel mechanical arrangements are similar. The repeater can be supplied with its own battery-backed 230VAC PSU, or without a PSU (powered directly from the Fire Alarm panel's Auxiliary DC output).

Repeaters are only supported on the 4-zone & 8-zone panels.

Up to 3 repeaters can be connected to the panel.

The panel controls the Repeaters through the RS485 serial communications link.

3. Functional Specification

3.1 Panel Input/Output List

See Table 1 below.

Table 1 – Panel Input/Output List

Input/Output	1-Zone	2-Zone	4-Zone	8-Zone
Detection zones	1	2	4	8
Multi-function Remote control Input: Class Change, Alert, Evacuate, Silence alarms, Reset	1	1	1	1
Disablement Output	1	1	1	1
Evacuate Output	1	1	1	1
Buzzer Active Output	1	1	1	1
Standard Sounder circuits	2 @ 500mA	2 @ 500mA	4 @ 500mA	4 @ 500mA
Monitored Fire Signal Output	1 @ 250mA	1 @ 250mA	1 @ 250mA	1 @ 250mA
Auxiliary Fire Relay O/P (Volt Free Change Over)	1	1	1	1
Auxiliary Fault Relay O/P (Volt Free Change Over)	1	1	1	1
Auxiliary 28VDC Supply [fused]	1 @ 250mA	1 @ 250mA	1 @ 250mA	1 @ 250mA
Repeater facility	N/A		Two terminals for serial comms.	

3.2 Features List

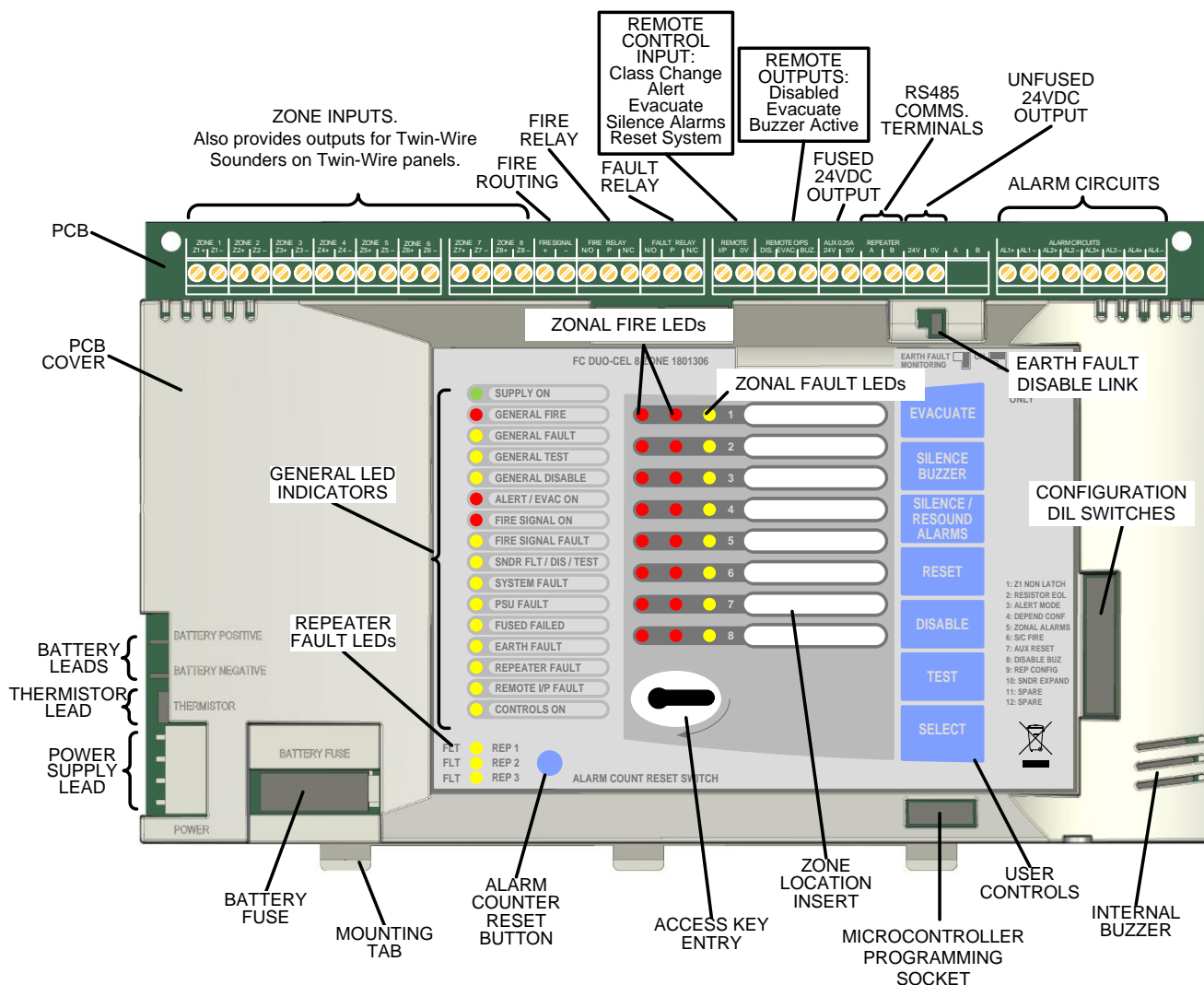
Enclosure	Injection moulded, 3-part, ABS plastic, flame retardant enclosure. Surface or Semi-flush mounting. 14 x 20mm Gland knockouts at the top.
Temperature-compensated battery charging	Battery charging voltage is automatically adjusted between 28.25Vdc and 26.72Vdc over an ambient temperature range of –5°C to +40°C.
Battery disconnect	Prevents permanent damage to the battery due to deep discharge by automatically disconnecting it when the battery voltage falls below 21.6V.
Remote Control input providing five controls:	
1. Class Change	Operates all sounders for up to 5 seconds without giving any panel indications.
2. Alert	Pulses all sounders and operates the fire buzzer.
3. Evacuate	Operates all sounders continuously and operates the fire buzzer.
4. Silence Alarms	Latches the Silence Alarms condition until a new alarm condition is detected or until panel reset.
5. Reset	Returns the panel to the quiescent state after a fault or alarm condition.
Configurable detection zones	DIL switch configuration provides the following capabilities: <ul style="list-style-type: none">• Latching or non-latching Fire indication on zone 1.• Resistor or capacitor EOL monitoring – applies to all zones. (Not functional on Twin-Wire panels)• Zone Short Circuit gives fault or fire alarm (for backwards compatibility) – applies to all zones. Factory configuration: Latching zone 1 Fire indication Capacitor EOL (not for twin-wire) Zone Short circuit gives fault.
Selectable Zonal or General Alarm Sounder operation	Selectable via DIL switches on the motherboard. When set to Zonal, the sounders operate as follows: Twin-wire panels (1 to 8 zone): All 2-wire sounders operate zonally, normal sounder circuits operate as general alarms Standard panels, 1 to 4 zone panels: Sounder circuits 1 to 4 operate individually for a fire condition on the respective zone. Standard panels, 8-zone panel: Sounder circuits 1 to 4 operate as general alarms.
Alert Sounder operation	DIL switch selectable on the motherboard. When the Alert Mode DIL switch is set to the ON position, sounders pulse for automatic detector alarms and are continuous for Manual Call Point alarms. NOT COMPATIBLE WITH RESISTOR EOL.
Zonally configurable co-incidence (dependency) for Automatic Fire Detectors	Programmable facility which allows any zone to be configured for co-incidence (dependency) detection. Requires two occurrences of detector activation within 30 minutes before an alarm is raised. Manual call points are not affected.

Fire Signal Output	Fully fault monitored output, providing 28VDC (nominal) at up to 250mA when active.
Fire Relay Output	Non- monitored Relay output, providing one set of volt-free change-over contacts.
Fault Relay Output	Non- monitored Relay output, providing one set of volt-free change-over contacts, with fail-safe operation (fault signalled if total power failure)
Short Circuit Fire Option	<p>A DIL switch selectable option on the motherboard to allow a short circuit on the zones to be indicated as an alarm. For compatibility with older detectors which do not have current limiting circuits.</p> <p>NOTE: Automatic fire Detector activation will be detected by the panel as a Manual Call Point alarm.</p>
Auxiliary 24VDC 250mA power supply output	<p>Protected by a fast acting electronic fuse. Operation of the fuse is indicated on the display. Operation of the Reset button on the panel display resets the electronic fuse.</p> <p>DIL switch configurable to switch off for 10 seconds during panel reset.</p>
Open collector outputs	<p>Three outputs capable of sinking 50mA each:</p> <ul style="list-style-type: none">• Buzzer Active.• Disablement Active.• Evacuate Active.
Earth Fault monitoring	Can be disabled by removing a link on the control board.
Zone/Output disablement feature	<p>The following circuits can be independently disabled/enabled:</p> <ul style="list-style-type: none">• Each Zone• Fire Signal Output• All Sounders
Buzzer disablement feature	<p>DIL switch selectable option to allow the buzzer and Buzzer Active output to be prevented from operating.</p> <p><u>Intended for use during commissioning and maintenance only.</u></p>
One Man Zone Test	<p>Each zone can be independently set to the One Man test condition. Sounders will operate momentarily as per configuration of zonal alarms & alert mode.</p> <p>NOTE: Zone Dependency (co-incidence) is not applied during one-man-test on a test zone.</p>
One Man Sounder Test	Operates the general sounders (and twin-wire sounders if twin-wire panel) intermittently.
Automatic fire detector and manual call point fire event discrimination	Each zone is capable of recognising whether a fire condition has been caused by an automatic fire detector or a manual call point (unless the panel is configured to EOL resistor monitoring on the zones). This is used in conjunction with the dependency (co-incidence) feature and Alert alarm mode.
Alarm Counter	The panel keeps a record of the number times it enters the alarm condition. This count can be displayed on the display LEDs as a binary value, up to a maximum value of 999 (1111101001). The counter can be reset via a button on the motherboard which can only be accessed by removing the front cover.
Repeater panels	Support for up to 3 repeater panels via two-wire RS485 serial communication. [Repeaters are not available for the 1 & 2 zone panels].

4. DUO-CEL Panel – Control Board Features

Figure 3 illustrates the control board for the 8 zone DUO-CEL panel with the PCB cover fitted.

Figure 3 – Panel control board and PCB cover



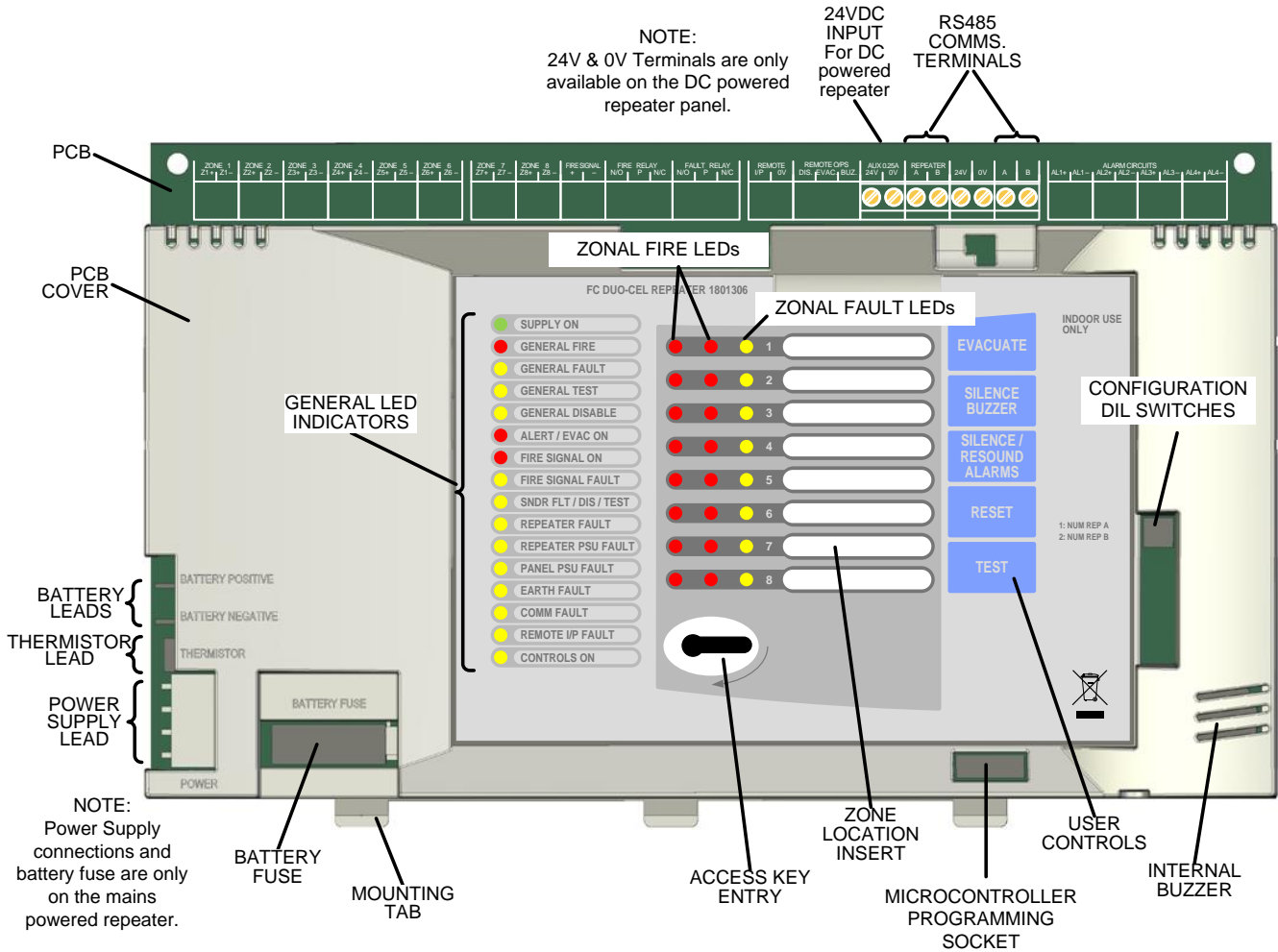
Note:

The Microcontroller programming socket is for use during manufacturing only and should not have any links fitted across any of the pins. Improper use of the connector may result in permanent damage to the control board.

5. DUO-CEL Repeater – Control Board Features

Figure 4 illustrates the control board for the DUO-CEL repeater with the PCB cover fitted.

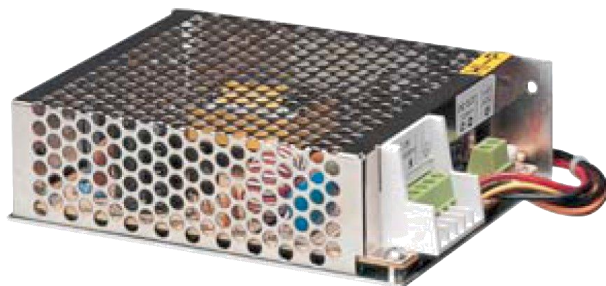
Figure 4 – Repeater control board and PCB cover



Note:

The Microcontroller programming socket is for use during manufacturing only and should not have any links fitted across any of the pins. Improper use of the connector may result in permanent damage to the control board.

6. Power Supply



6.1 General

The DUO-CEL uses a BENTEL BAQ35T24 switch mode Power Supply which has the following features:

- Input voltage: 230 VAC 50/60Hz
- Output voltage: 27.15VDC (nominal @ 25°C)
- Stability over 1% with full load
- Overload protection
- Short-circuit protection
- Insulation class 1
- Tested and approved to EN 60950:1996 + A4:1997
- Dimensions: 130mm x 100mm x 38mm
- Weight: 389g

The battery monitoring circuit is part of the control board. This provides:

- Thermistor for temperature compensation
- Battery/charger fault monitoring
- Automatic "battery disconnect" facility. Disconnects the battery when the battery terminal voltage falls below 21.6V, to prevent deep discharge of the batteries if supplying the panel for an abnormally long period of time.

6.1.1 Supply Input

The PSU is designed to run from mains voltage at 230Vac +10%, -15%, 50/60Hz. The input is protected by a 3A 20mm glass fuse. The fuse is inside the metal cage and is not user-serviceable.

6.1.2 Supply Output

The output from the PSU is 27.15Vdc \pm 1% at 25°C with load up to 1.5A. The output is protected by a 6.3A 20mm glass fuse. The fuse is inside the metal cage and is not user-serviceable.

The output current is shared between the panel load and battery charging. The battery charging current is therefore dependent on output current and will fall to zero as the panel load approaches 1.5A.

The output is connected to the panel via a three-wire flying lead, providing the DC power and a fail-safe fault signal.

6.1.3 Battery Charger

The power supply is capable of charging 2-off 12V 3.4Ah SLA Powersonic PS-1230 batteries.

The power supply unit monitors a Thermistor on the panel control board and automatically adjusts the output voltage to provide the optimum safe charging voltage over an operating temperature range of -5°C to +40°C.

The charging voltage can be adjusted via the trimmer potentiometer VR1 on the PSU. However, the charging voltage is factory set and adjustment should not be necessary (a 15K resistor can be used in place of the Thermistor to simulate 25°C).

NOTES:

1. The battery charging voltage is temperature dependant and should be set as detailed in Table 2. Charging at too high a voltage may result in overheating, resulting in damage to the batteries. Charging at too low a voltage will result in insufficient charging of the batteries.
2. The charging profile of the power supply unit is optimised for Powersonic™ batteries and charging of other manufacturers' batteries is not recommended. Consult your battery supplier or battery manufacturer before use.

Table 2 – Float Charge Voltages for Powersonic VRLA batteries

Ambient Temperature	Charger Set voltage (V)	Float Charge Voltage (V) (2x12V Batteries in series)
-10°C (14°F)	28.32 – 28.42	27.84 – 28.44
0°C (32°F)	27.82 – 27.92	27.60 – 28.20
10°C (50°F)	27.45 – 27.55	27.36 – 27.96
20°C (68°F)	27.20 – 27.30	27.12 – 27.72
25°C (77°F)	27.10 – 27.20	27.00 – 27.60
30°C (86°F)	27.03 – 27.13	26.88 – 27.48
40°C (104°F)	26.91 – 27.01	26.64 – 27.24
50°C (122°F)	26.84 – 26.94	26.40 – 27.00

6.1.4 Battery Monitoring

The health of the batteries, the battery connections and fuse are checked by a battery monitor circuit on the panel control board.

- The batteries are monitored for disconnection. If the battery voltage falls to 18V or below then a PSU fault is raised and the charging voltage is removed from the terminals.
- The batteries are monitored for low voltage. If the battery voltage drops below 21.6V when the mains power is disconnected, then the batteries are electronically disconnected to prevent deep discharge. The batteries are reconnected only after mains power is restored.
- The batteries are monitored periodically for high

internal resistance. A PSU fault will be raised if high resistance is detected. This test involves loading the batteries so a battery load test is also performed.

6.1.5 Visual indications

The Power Supply Unit has only one green LED. This indicates that there is power available on the output of the power supply.

6.1.6 Fault Conditions

The yellow fault wire from the PSU is normally at 27Vdc (nominal). The panel monitors this signal and indicates a PSU fault if the voltage is removed.

6.2 Mechanical Protection

Warning:

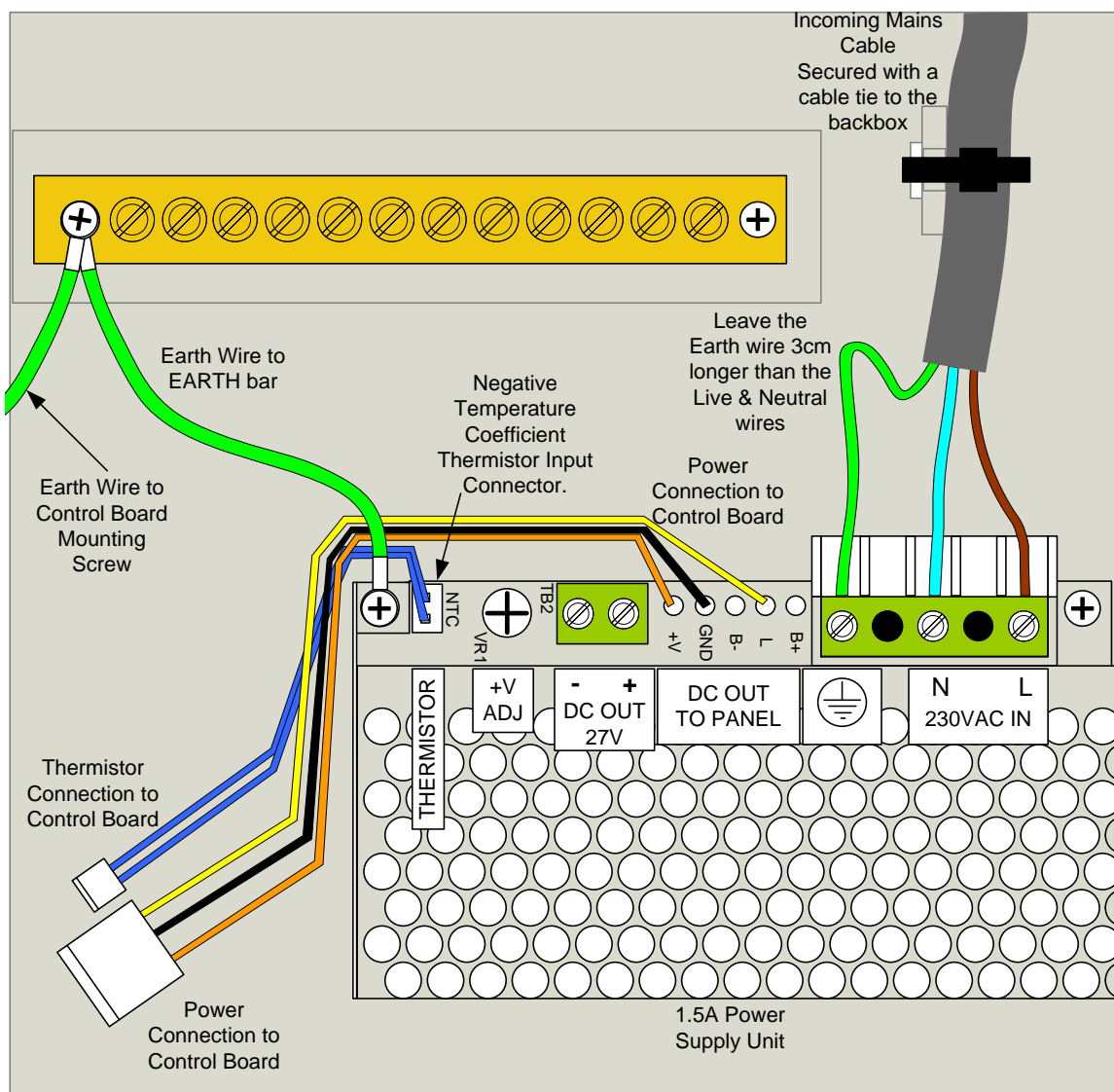
The power supply uses hazardous voltages. The unit is fitted with a protective cage to protect service engineers from electrical shock. Do not attempt to open or access any of the internal components. The power supply contains no user serviceable parts.

To prevent overheating, the ventilation holes in the cage must not be obscured.

6.2.1 DUO-CEL Power Supply Features and Connections

Figure 5 shows the layout of the BAQ35T24 Power Supply.

Figure 5 – BAQ35T24 1.5A Power Supply Layout



NOTE: The black wire may be connected to (B-) instead of (GND) on the PSU. This is quite normal and does not affect the operation of the PSU in any way.

7. Compatible Field Devices

The DUO-CEL panel is compatible with the devices listed in section 7.1.

7.1 Field Device Part Numbers

Manufacturer	Part no.	Description	Standby Current (mA)	Max. Devices Per standard zone (10uF EOL)	Max. Devices Per Twin-wire zone
Thorn/Tyco	MF601	Smoke Detector Ionisation	0.035	32	16 (30)
Thorn/Tyco	MR601	Smoke Detector Optical	0.050	32	16 (24)
Thorn/Tyco	M600	Series 600 Universal Base	0.000	N/A	N/A
Thorn/Tyco	MR601T	High Performance Smoke Detector Optical	0.060	32	16 (20)
Thorn/Tyco	MD601	Heat Detector Rate Of Rise	0.043	32	16 (27)
Tyco	601CH	Conventional Enhanced CO Detector	0.057	32	16 (21)
Tyco	601H-R	Conventional Heat Detector (Rate of Rise)	0.057	32	16 (21)
Tyco	601H-F	Conventional Heat Detector Fixed Temperature {60 Deg C}	0.057	32	16 (21)
Tyco	601P	Conventional Optical Smoke Detector	0.057	32	16 (21)
Tyco	601PH	Conventional High Performance Optical Smoke Detector	0.057	32	16 (21)
Thorn/Tyco	CP200	Alert Manual call point (590R)	0.000	32	5
Thorn/Tyco	MCP200	Alert Manual Call Point (590R)	0.000	32	5
Thorn/Tyco	CP211	Evacuate Manual Call Point (Current Limit)	0.000	32	16
Thorn/Tyco	CP230	Alert Manual call point (590R)	0.000	32	5
Thorn/Tyco	MCP230	Alert Manual Call Point (590R)	0.000	32	5
Thorn	CP260	Alert Manual Call Point (538R)	0.000	32	5
Tyco	MCP260	Alert Manual Call Point (538R)	0.000	32	5
Non Branded	5B	5" Conventional Base	0.000	N/A	N/A
Apollo	ORB-OP-12001-APO	Orbis Optical Smoke Detector	0.093	32	12 (13)
Apollo	ORB-HT-11001-APO	Orbis A1R Heat Detector	0.093	32	12 (13)
Apollo	ORB-OH-13001-APO	Orbis Multi-sensor Smoke/Heat Detector	0.093	32	12 (13)
Apollo	ORB-HT-11006-APO	Orbis CS Heat Detector	0.093	32	12 (13)
Apollo	ORB-MB-00001-APO	Orbis TimeSaver Base	0.000	N/A	N/A
Apollo	ORB-MB-00002-APO	Orbis TimeSaver Base LX (simplified)	0.000	N/A	N/A
Apollo	ORB-DB-00003-APO	Orbis TimeSaver Diode Base	0.000	N/A	N/A
Apollo	ORB-MB-00012-APO	Orbis LX Base (low cost)	0.000	N/A	N/A
Apollo	ORB-BA-10008-APO	Series 65 to ORBIS Base Adaptor	0.000	N/A	N/A
Apollo	55000-217	Series 65 ionisation detector	0.035	32	16 (30)
Apollo	55000-317	Series 65 Optical detector	0.050	32	16 (24)
Apollo	55000-122	Series 65 heat detector A1R	0.035	32	16 (30)
Apollo	55000-125	Series 65 heat detector BR	0.035	32	16 (30)
Apollo	55000-132	Series 65 heat detector CR	0.035	32	16 (30)
Apollo	55000-137	Series 65 heat detector CS	0.035	32	16 (30)
Apollo	55000-200	Series 60 ionisation detector	0.035	32	NONE

EQUIPMENT: **FIRECLASS DUO-CEL**

WRITTEN BY: RKP

PUBLICATION: **OM_DUO-CEL_APP**

CHECKED BY: AP

ISSUE No. & DATE: 0 01/03/12

Manufacturer	Part no.	Description	Standby Current (mA)	Max. Devices Per standard zone (10uF EOL)	Max. Devices Per Twin-wire zone
Apollo	55000-210	Series 60 integrating ion detector	0.035	32	NONE
Apollo	55000-100	Series 60 Grade 1 heat detector	0.035	32	NONE
Apollo	55000-101	Series 60 Grade 2 heat detector	0.035	32	NONE
Apollo	55000-102	Series 60 Grade 3 heat detector	0.035	32	NONE
Apollo	55000-103	Series 60 Range 1 heat detector	0.035	32	NONE
Apollo	55000-104	Series 60 Range 2 heat detector	0.035	32	NONE
Apollo	55000-300	Series 60 optical detector	0.050	32	NONE
Apollo	55000-380	Series 60 optical/heat detector	0.050	32	NONE
Apollo	45681-200	Series 60 mounting base	0.000	32	NONE
KAC	WR2072-470	Alert Manual call point (470R)	0.000	32	4
System Sensor	2351E	Optical Smoke Detector	0.160	20	8
System Sensor	2351TEM	Optical & Heat Detector	0.270	10	4
System Sensor	5351E	ROR Heat Detector	0.140	20	8
System Sensor	4351E	High Temperature Heat Detector	0.140	20	8
System Sensor	B401RSD	Base c/w 470R resistor & Diode	0.000	20	8
Fulleon	SQG3/SDR	2-wire Squashni Sounder	0.050	N/A	12
Fulleon	SQG3/AV	2-wire Squashni Sounder Beacon	0.050	N/A	8
Fulleon	Squashni	2-wire Squashni Sounder	0.050	N/A	4
Fulleon	Symphoni	2-wire Symphoni Sounder	0.050	N/A	9

Notes:

1. The recommended cable is FP200 or MICC PYRO:

CABLE 1.5mm csa	Resistance per Km per Core (Ω)	Capacitance per Km Core to Core (uF)	Capacitance per Km Core to Screen (uF)
FP200	12.1	0.08	0.15
MICC PYRO Light Duty	12.1	0.19	0.21
MICC PYRO Heavy Duty	12.1	0.13	0.17

2. Maximum Cable length is 300m, or 3.63Ω per core, 63nF core to core & core to screen.
3. The maximum number of detectors and sounders per zone in section 7.1 assumes no mixing of devices. The total number of detectors and/or manual call points per zone must not exceed 32. This is a recommendation of BS EN54-2:1997 Annex D. The additional limitations for twin-wire operation are listed in note (7) below.

4. The Maximum number of devices per zone is based on factory default monitoring configuration [10uF capacitor EOL for the standard panel or composite device for the twin-wire panel]. For resistor EOL or Twin-Wire, the total quiescent current drawn per zone by all devices on the zone should not exceed 1.6mA. Exceeding this current will result in a failure to correctly detect an open circuit or head removal.
5. The number in brackets for the twin-wire zone is the maximum number of devices allowed if **NO** twin-wire sounders are connected to the zone.
6. The values are for guidance only and will vary for individual detectors and cable types. Each zone must be fully checked for correct operation & fault monitoring during installation & commissioning.
7. When using twin-wire sounders, observe the following additional requirements:
 - a. **DO NOT** exceed the maximum number of sounders per zone as listed in the above table in section 7.1. These figures are based on extensive testing and allow for operation

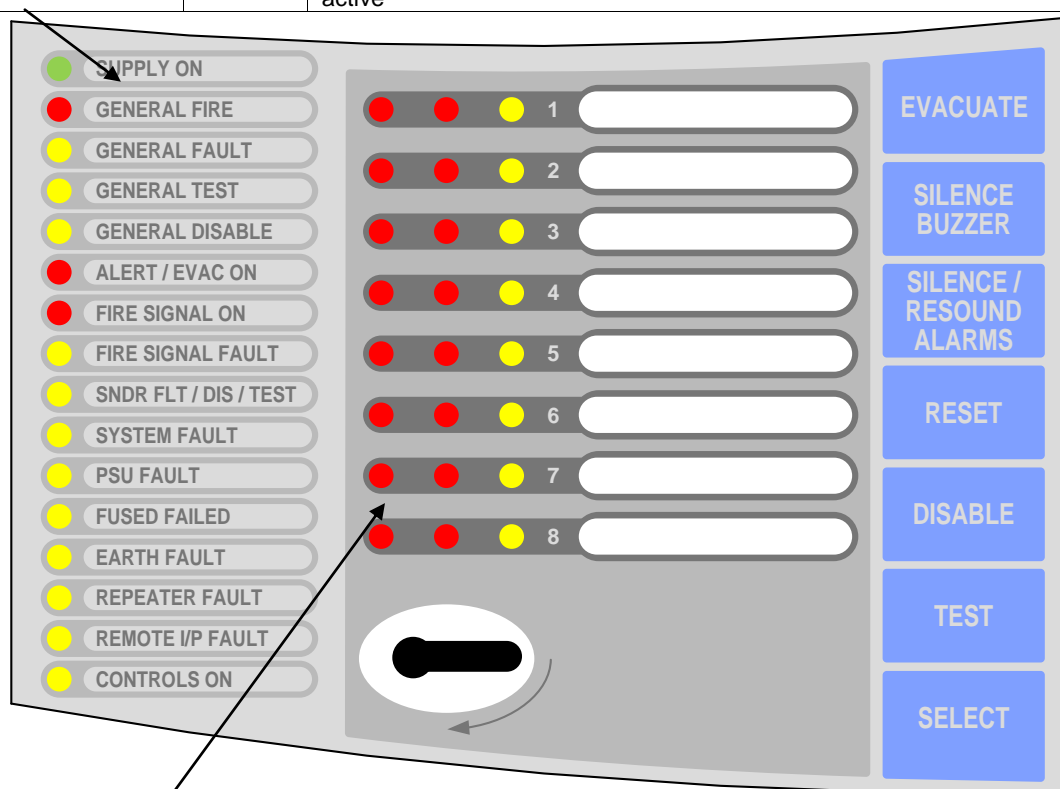
- at low battery voltage and no mains power, on long cable runs.
- b. When mixing different types of sounders on the same zone, use the lowest quantity shown in the table. For example, you can have 12 SQG3/SDR on a zone as long as no other sounders are connected on that zone. If you want to mix SQG3/SDR with SQG3/AV then the TOTAL number of sounders on the zone should be limited to 8 (e.g. 7 x SQG3/SDR and 1 x SQG3/AV).
- c. DO NOT leave any detector bases empty. All bases should have a detector fitted or be linked through. Empty bases will introduce a diode into the positive line and this will adversely affect the operation of the sounders.
- d. Reducing the number of sounders WILL NOT allow more detectors to be used, unless no sounders are connected (see number in brackets in the table).
- e. All detector bases must have a 1N4002 diode fitted across the line IN and line OUT terminals (usually on the positive line but sometimes on the negative line). Some detector bases come with Schottky diodes fitted. These are not compatible with the 2-wire zone operation and must be **replaced** with 1N4002 diodes. This applies even if no sounders are connected. Use of a Schottky diode will prevent the panel from detecting a detector head removal.
8. If using detector bases without diodes fitted, then removal of a detector head will result in an open circuit of the cable. All devices fitted to the zone cable beyond the detector head removed will no longer be powered and will therefore not operate. Only use detector bases without diodes if the zone has no 2-wire sounders and no Manual Call Points, or is configured to Resistor EOL.

8. Overview Of User Functions

This section gives an overview of the functions available to the end user.

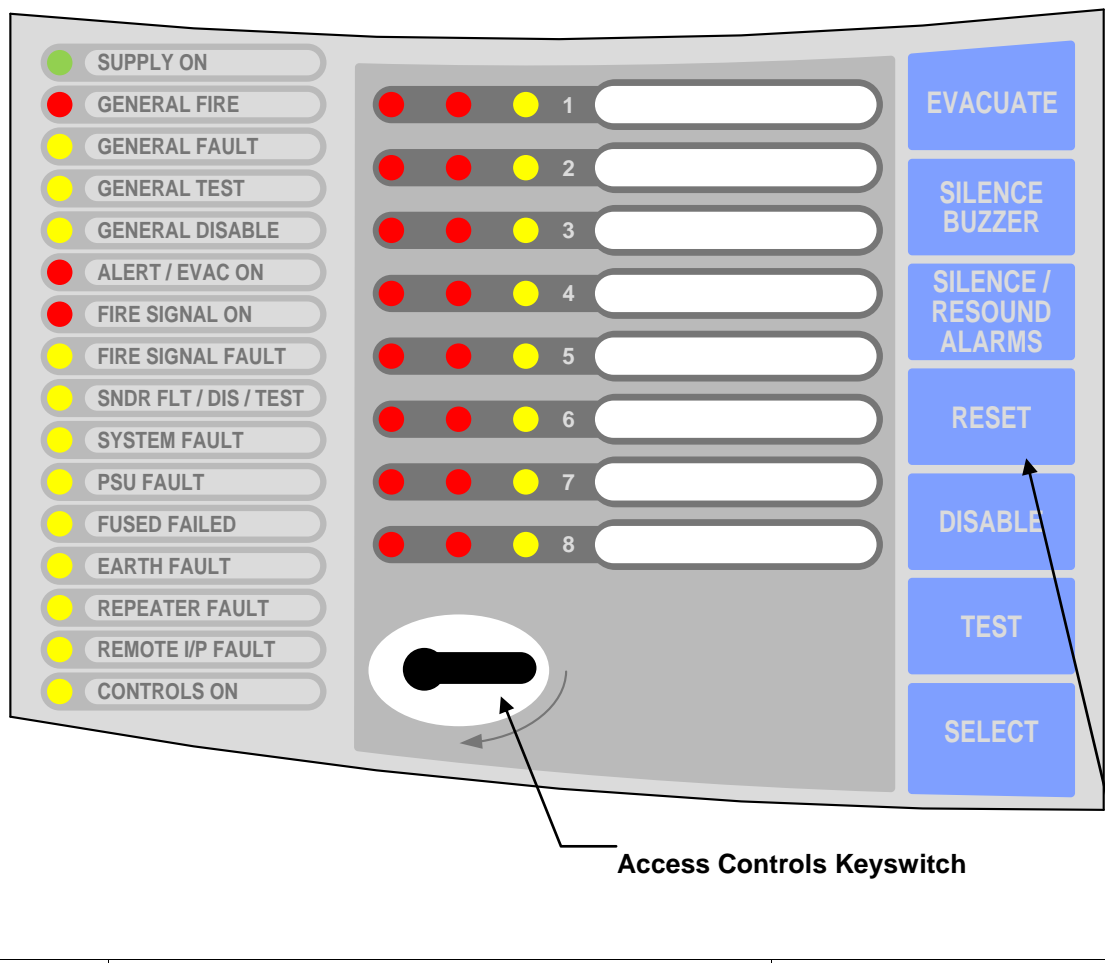
8.1 User Indications

General Indicator Section		
Indicator	Colour	Operating Condition
Supply On	Green	OFF: No mains or battery power, ON: Panel has power (battery and/or mains)
General Fire	Red	OFF: Quiescent, FLASH: New Alarm Condition, ON: Alarm Accepted
General Fault	Yellow	OFF: No faults present, FLASH: One or more faults present
General Test	Yellow	OFF: No circuits in Test, ON: One or more circuits in Test
General Disabling	Yellow	OFF: No circuits Disabled, ON: One or more circuits Disabled
Alert/Evac On	Red	OFF: No Alert or Evacuate, FLASH: Remote Alert active. ON: Remote Evacuate active or Panel Evacuate active
Fire Signal On	Red	OFF: Fire Signal output not active, ON: Fire Signal output active
Fire Signal Flt / Dis / Tst	Yellow	OFF: No fault on Fire Signal output, FLASH: Fault on Fire Signal output, ON: Fire Signal output Disabled or in test
Sounder Flt / Dis / Dis	Yellow	OFF: No Fault on Sounder circuits, FLASH: Fault on one or more Sounder circuits, ON: Sounder circuits Disabled or in Test
System Fault	Yellow	OFF: System is working correctly, ON: System is not functional. (Microcontroller failed or EEPROM data corrupted)
PSU Fault	Yellow	OFF: power supply is healthy, FLASH: PSU fault and/or battery fault
Fuse Failed	Yellow	OFF: Auxiliary 24Vdc output available, FLASH: Electronic Fuse on Auxiliary 24Vdc output activated
Earth Fault	Yellow	OFF: No cable faults to Earth, FLASH: One or more cable faults to Earth
Repeater Fault	Yellow	OFF: No Repeater faults, FLASH: One or more Repeater faults
Remote Control Fault	Yellow	OFF: No faults on Remote Control input, FLASH: Fault on Remote Control input
Controls On	Yellow	OFF: User Controls disabled, ON: User Controls enabled, FLASH: Select mode active



Zone Location Indications		
Indicator	Colour	Operating Condition
User Zone Location Text	Red	OFF: No Alarm on zone, FLASH: New Alarm on zone, ON: Alarm accepted on zone. NOTE: With Detector/MCP discrimination, the left LED is for MCPs, the right LED for Detectors.
User Zone Location Text	Yellow	OFF: No Fault on zone circuit, FLASH: Fault on zone circuit, ON: Zone circuit Disabled or in Test

8.2 User Controls



Switch	Functionality	Button Availability
Evacuate	Operates all sounders continuously and pulses the Alert/Evac On LED until the Silence/Resound Alarms button is operated	When controls are unlocked.
Silence Buzzer	Silences the internal buzzer on the Panel & Repeaters.	When controls are locked or unlocked
Silence/Resound Alarms	When any sounders are active, press to silence sounders. Press again to resound the silenced sounders.	When controls are unlocked
Reset	Press to clear any fault & alarm conditions and return the panel to the quiescent state	When controls are unlocked
Disable	Displays Alarm Counter	When controls are locked
	Illuminates only the currently disabled circuits	When controls are unlocked
	Toggles the selected circuit between Disabled & Enabled states.	When controls are unlocked and in circuit select mode
Test	Press to illuminate all LEDs and sound the buzzer for 5 seconds.	When controls are locked
	Illuminates only the circuits currently in test	When controls are unlocked
	Toggles the selected circuit between Test & Normal states.	When controls are unlocked and in circuit select mode
Select	First operation enables the circuit select mode; subsequent operations move the flashing cursor through the available circuits until the last circuit and then exits the circuit select mode.	When controls are unlocked

8.3 Selection of Zones or Outputs for Disablement, Enablement or Test

The panel provides a simple and straightforward means of selecting the sounder outputs and/or zones which need to be disabled, re-enabled or set to the test mode. The Fire Signal Output can also be disabled and enabled or placed into the test mode.

The zone or output is selected using the Circuit Select feature. This allows the user to move a flashing cursor indication down through the yellow fault LEDs associated with the available circuits until the required zone or output is highlighted. The yellow LED for the selected zone/output flashes in "Cursor" mode, which is easily distinguishable from all other indications.

For each circuit that the Cursor is on, the General Test and General Disablement LEDs will indicate the current status of the circuit; flashing Test indicates the circuit is in Test mode, flashing Disablement indicates the circuit is disabled. Both LEDs OFF indicates the circuit is in normal operation.

- If the circuit is in normal operation, pressing the Disable button once will disable the circuit, causing the General Disablement LED to flash and the circuit fault LED to illuminate steady (with flashing cursor).
- If the circuit is in normal operation, pressing the Test button once will set the circuit to test mode, causing the General Test LED to flash and the circuit fault LED to illuminate steady (with flashing cursor).
- If the circuit is currently disabled, pressing the Disable button once will restore the circuit to normal, causing the General Disablement LED to switch off and the circuit fault LED to switch off (with flashing cursor).
- If the circuit is currently in test, pressing the Test button once will restore the circuit to normal, causing the General Test LED to switch off and the circuit fault LED to switch off (with flashing cursor).
- If the circuit is currently disabled, pressing the Test button once will change the circuit status from disabled to test mode, causing the General Disablement LED to switch off and the General Test LED to flash.
- If the circuit is currently in test, pressing the Disable button once will change the circuit status from test mode to disabled, causing the General Test LED to switch off and the General Disablement LED to flash.

NOTE: Disablements are stored in EEPROM and are not lost when the panel is powered down. Test conditions are cleared when the panel is powered down.

8.4 Disabled Zones and Outputs

Any or all of the zones can be disabled.

A disabled zone will have power supplied to it but will not report fire or fault conditions. The zone power is switched off briefly when the zone is disabled, and also when the zone is re-enabled. Detectors on a disabled zone are still able to enter the alarm condition but will not raise a fire alarm on the panel.

In the twin-wire mode, sounders on disabled zones will still be activated during a fire alarm unless the sounders have been disabled.

The fire panel will respond normally to fire device operations and wiring faults on all enabled zones.

The following outputs can also be disabled and enabled:

- All Sounder circuits including twin-wire (as a group operation).
- The Fire Signal Output.

A disabled output will not report fault conditions and will not be activated, although power for monitoring will still be applied.

8.5 Detector Zone Test.

When selected to the Test mode, devices connected to the zone can be operated for test purposes without operating the Fire Signal output or the Fire Relay.

The zone(s) to be set to the One Man Test condition are selected using the Cursor Select feature described in 8.3.

The features of the One Man Zone Test condition are:

- A fire condition on a zone in Test Mode will not operate any of the fire outputs.
- Sounders operate for 5 seconds and then automatically silence. Sounders operate in general or zonal mode in accordance with the panel configuration.
- After each test the panel and the device being tested are automatically reset allowing the next device to be tested without needing to return to the panel to silence and reset.
- If a fire condition occurs on any zone other than a zone in test mode, the panel responds fully to the fire condition as per its normal fire response and configuration.

8.6 Alarm Sounder One man Test

The One Man Sounder Test operates all sounders on an intermittent basis until the Test mode is manually cleared. This allows an engineer to walk the protected area and confirm the operation of all the sounders. The sounder on/off cycle is 2 seconds on and 15 seconds off to allow operation

to be confirmed without being too intrusive for other occupants.

A genuine fire alarm condition overrides the test mode and operates the sounders normally.

9. Overview of Engineers Functions

This section provides an overview of the functions available to the engineer.

9.1 Engineer's configuration process

On the DUO-CEL panel, most of the Engineer's configuration facilities are controlled by DIL switches located on the motherboard, accessed by removing the front cover of the panel. Each configuration feature has its own dedicated DIL switch. The DIL switches are as follows:

- 1: Z1 NON LATCH
- 2: RESISTOR EOL
- 3: ALERT MODE
- 4: DEPEND CONF
- 5: ZONAL ALARMS
- 6: S/C FIRE
- 7: AUX. RESET
- 8: DISABLE BUZ
- 9: REP CONFIG
- 10: SNDR EXPAND (not used)
- 11: SPARE
- 12: SPARE

Most functions simply require the appropriate DIL switch to be either ON or OFF.

The DEPEND CONF DIL switch initiates a programming mode in which the engineer is able to select the required zone and set or clear its dependency mode status. The dependency mode status is stored in EEPROM and is not lost if the panel is powered down.

The REP CONFIG DIL switch (not available on the 1 & 2 zone panels) initiates a programming mode in which the engineer is able to set the number of repeaters connected to the panel. This data is stored in EEPROM and is not lost when the panel is powered down.

On the DUO-CEL repeater, only two DIL switches are available:

- 1: NUM REP A
- 2: NUM REP B

Their setting is shown below:

Repeater No.	NUM REP A	NUM REP B
0 (Disabled)	OFF	OFF
1	ON	OFF
2	OFF	ON
3	ON	ON

9.1.1 Zone Dependency selection

When the zone dependency configuration DIL switch (Depend Conf) is switched to the ON position, the panel sounds the internal buzzer and illuminates the SYSTEM FAULT LED to indicate that the programming mode has been initiated. The current status of the zones is displayed on the zone fault LEDs; LED OFF – No Dependency, LED ON – zone configured for dependency.

Operation of the SELECT button will then switch the Select cursor on, flashing at the zone 1 fault LED.

Pressing the Select button again will move the flashing cursor to the next zone. The cursor will be switched off after the last zone (1, 2, 4 or 8, depending on the panel) or if no buttons are pressed for 30 seconds.

Note that in the Engineer's programming mode, any faults, tests or disablements are masked and are not shown on the display. The panel will not respond to faults or fires.

With the cursor flashing on the required zone, pressing the Disable button toggles the state of the Dependency mode for that zone.

Once all required zones have been configured and the configuration DIL switch is returned to the OFF position, the panel will return to normal operation.

Factory default:

All zones are configured for no dependency.

Dependency Details:

This mode of operation conforms to BS EN54-2:1997 Clause 7.12.1 Type A Dependency.

Operation of an automatic fire detector on a zone configured to the dependency mode will **not** immediately indicate the fire alarm condition on the panel. A 30-minute counter will be started and the zone will be held in reset for 5 seconds (no power). After the zone power is reinstated, if any automatic fire detector on the same zone operates within 30 minutes, the panel will raise the fire alarm condition.

If no detectors or MCPs are operated on the zone before the 30-minute timer ends, the zone will return to coincidence detection (i.e. a detector alarm on the zone will start the 30-minute timer again).

Operation of Evacuate MCPs at any time will always raise a fire alarm immediately.

Operation of an automatic fire detector or MCP on any zone not configured for dependency will always raise a fire alarm immediately.

9.1.2 Repeater configuration

When the Repeater configuration DIL switch (REP CONFIG) is switched to the ON position, the panel sounds the internal buzzer and illuminates the SYSTEM FAULT LED to indicate that the programming mode has been initiated. The current

status of the repeater configuration is also displayed on the Repeater Fault LEDs, which are visible when the front cover is removed.

Operation of the Select button will increment the number of repeaters, up to a maximum of 3, after which the number is reset to zero.

Number of Repeaters	REP1 FLT LED	REP2 FLT LED	REP3 FLT LED
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	ON	ON	OFF
3	ON	ON	ON

Once the required quantity of repeaters has been configured and the configuration DIL switch is returned to the OFF position, the panel will return to normal operation.

Factory default: No Repeaters

9.2 Zone 1 Non-latch operation

The Zone 1 non-latch DIL switch allows zone 1 to be set to non-latching fire indication.

In this mode a fire condition on zone 1 operates the sounders but not the Auxiliary Fire Relay. The alarm indication automatically clears when the fire condition is removed from zone 1, without the need to manually reset the panel.

9.3 Resistor EOL

The Resistor EOL DIL switch configures all zones to monitor an end-of-line resistor (6K8 to 3K9) instead of the default 10uF capacitor. This feature is not available on the twin-wire panel (i.e. the switch has no effect).

In the default mode, the panel actively checks for the presence of a 10uF capacitor at the end of the zone wiring. Diodes are fitted to detector bases and removal of a detector will result in a fault condition being raised at the panel whilst still providing power to all devices on the zone.

In Resistor EOL mode, the panel monitors the current drawn by the EOL resistor and indicates a fault if the current drops below the threshold. Diodes cannot be fitted to detector bases otherwise a detector removal could not be detected. Therefore, a removal of a detector will create an open circuit and remove power from all devices beyond the removed detector.

NOTE:

Resistor EOL monitoring is provided for older installations where it is difficult to change the EOL resistor to a capacitor.

In addition, detector/MCP discrimination will not work when the zone monitoring is configured for Resistor EOL and therefore zone alarm dependency (coincidence detection) and Alert Mode will not work correctly.

9.4 Twin Wire

The Twin Wire panels support Fulleon twin-wire sounders on the zone circuits along with compatible detectors (see section 7.1).

Each zone can monitor detectors and operate sounders on the same two wires. The sounders are activated by pulsing the zone voltage between 11Vdc & 24Vdc (nominal).

The EOL device consists of a Zener diode and resistor which draws about 4mA in quiescent. A detector head removal (assuming diode bases are used) will result in a small voltage drop, which the panel can monitor & indicate a zone fault.

The zones are also capable of discriminating between detector and manual call point alarms and so zone dependency mode is compatible with twin-wire panels.

NOTE:

Only TYCO CP211 Manual Call Points can be used. This is because standard call points will apply a resistive load and if multiple call points are operated on a single zone then the load will be too great to allow the twin-wire sounders to operate. The CP211 contains current limiting circuitry such that multiple call points will draw as much current as a single call point (current is shared between call points) and will not affect sounder operation. The CP211 also prevents excessive loading on the zone when the zone sounders are operated

9.5 Alert Mode

The Alert Mode DIL switch configures all zones to discriminate between detector alarms and MCP alarms. Detector Alarms are treated as Alert, MCP alarms are treated as Evacuate.

The Sounder circuits are pulsed (1.5 second on, 1.5 second off) during the Alert alarm and operate continuously during the Evacuate alarm.

When used in conjunction with Zonal Sounder operation, a detector alarm will only pulse the relevant zonal sounder circuit with all other sounder circuits silent. A MCP alarm will operate the relevant zonal sounder circuit continuously and pulse all other sounder circuits.

On the display, the left zonal fire LED operates for MCP alarms, the right zonal fire LED operates for detector alarms.

NOTE:

Call points should be TYCO CP211 for Twin-Wire panels. For the standard panels the TYCO CP211 or a conventional type may be used, but the MCP resistor needs to be 220R to 360R. Standard call points with 470R to 680R will be monitored as a detector alarm instead of a MCP alarm.

This feature will not work correctly with Resistor EOL monitoring.

9.6 Selectable Zonal or General Alarm Sounder operation

The Zonal Alarms DIL switch allows the sounder circuits to operate zonally in line with the zone in alarm. The actual operation of the alarm circuits will vary depending on the type of zone detection and number of zones available on the panel.

Twin-wire panels (1 to 8 zone):

All twin-wire sounders operate zonally, sounder circuits on the motherboard operate as general alarms (i.e. all four alarm circuits on the motherboard operate for any zone fire)

Standard panels, 1 to 4 zone panels:

Sounder circuits 1 to 4 operate individually for a fire condition on the respective zone.

Standard panels, 8-zone panel:

Sounder circuits 1 to 4 operate as general alarms (i.e. all four alarm circuits on the motherboard operate for any zone fire). Zonal sounder operation is not available.

9.7 Buzzer Disable

The DISABLE BUZ DIL switch allows the panel buzzer and Buzzer Active output to be disabled so that they do not operate for alarms or faults. The panel buzzer will still operate for button presses.

The panel does not give any indication that the buzzer has been disabled. This feature is provided for use during panel commissioning and maintenance only. Ensure that the DIL switch is returned to the OFF position after commissioning/maintenance tests are complete.

9.8 Earth Fault monitoring.

The DUO-CEL panel is designed to monitor for low impedance faults to earth on the field cables. Earth faults can lead to false alarms or failure to operate the sounders or other outputs.

For installations where earth fault monitoring is unsuitable, it can be disabled by removal of the insulated jumper link (see Figure 3). The link can be rotated and placed just on one pin rather than across both pins. **This should be done only after all field cabling has been tested and confirmed to be free from faults.**

10. Panel Repeaters

The DUO-CEL repeaters duplicate the panel indications and main user controls at a location remote from the main panel. The repeater uses the same enclosure & control board as the fire alarm panel although most of the components are depopulated from the control board. Up to 3 repeaters can be connected to a single panel using an RS485 serial connection.

Each repeater can be powered either from the Auxiliary 24Vdc output of the panel or an internal power supply (optional).

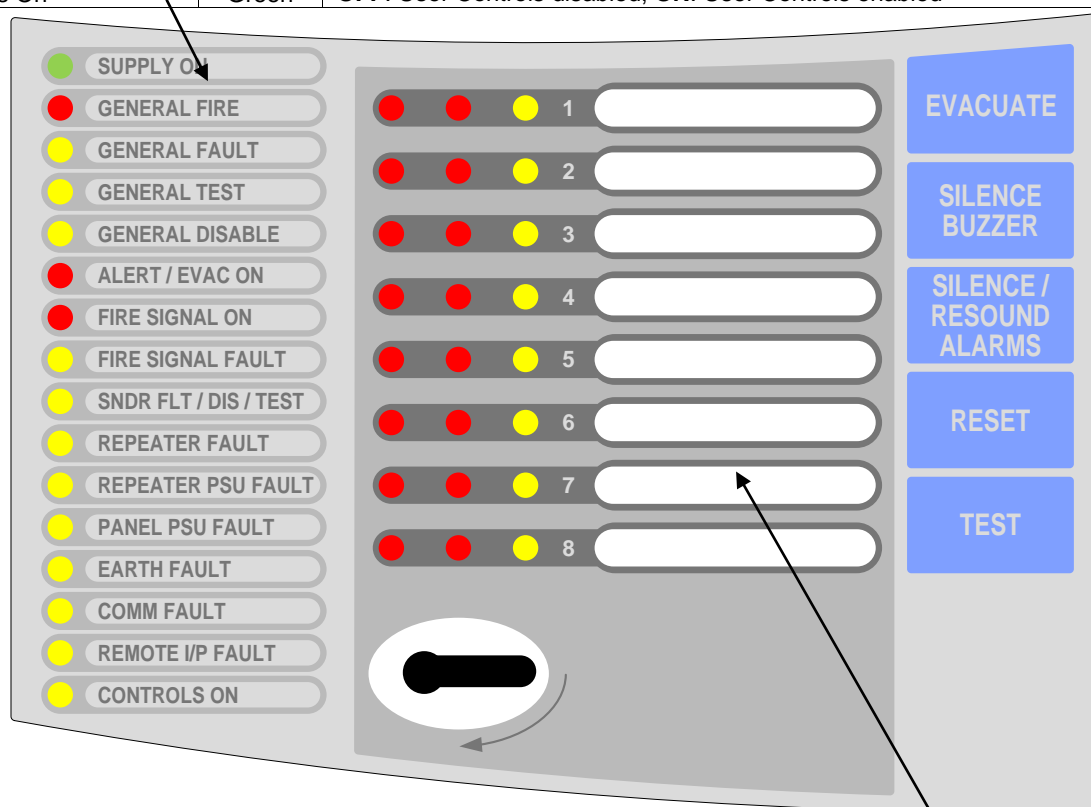
Note:

The disable/enable/test facilities and the configuration functions are not available at the repeaters.

Repeaters cannot be used with the 1 & 2 zone panels.

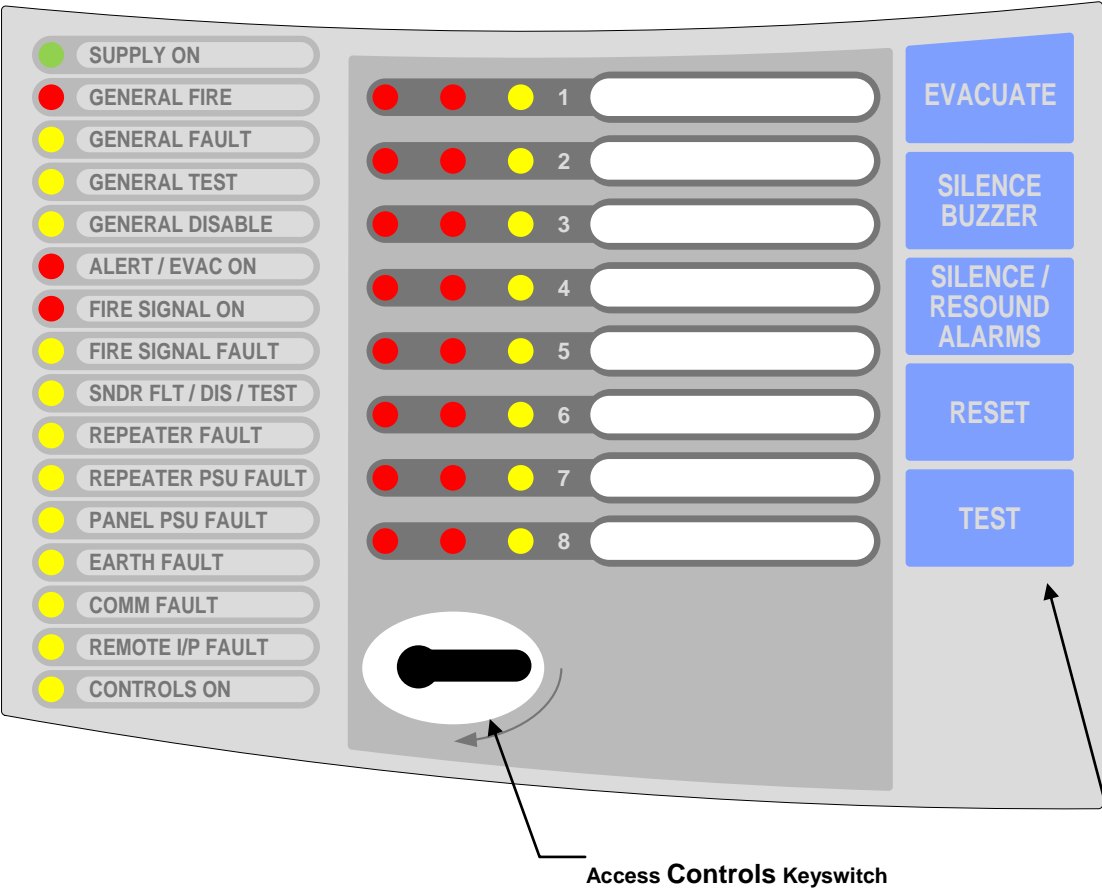
10.1 Repeater User Indications

General Indicator Section		
Indicator	Colour	Operating Condition
Supply On	Green	OFF: No mains or battery power, ON: Panel has power (battery and/or mains)
General Fire	Red	OFF: Quiescent, FLASH: New Alarm Condition, ON: Alarm Accepted
General Fault	Yellow	OFF: No faults present, FLASH: One or more faults present
General Test	Yellow	OFF: No circuits in Test, ON: One or more circuits in Test
General Disablement	Yellow	OFF: No circuits Disabled, ON: One or more circuits Disabled
Alert/Evac On	Red	OFF: No Alert or Evacuate, FLASH: Remote Alert active. ON: Remote Evacuate active
Fire Signal On	Red	OFF: Fire Signal output not active, ON: Fire Signal output active
Fire Signal Flt / Dis / Tst	Yellow	OFF: No fault on Fire Signal output, FLASH: Fault on Fire Signal output, ON: Fire Signal output Disabled or in Test
Sounder Flt / Dis / Tst	Yellow	OFF: No Fault on Sounder circuits, FLASH: Fault on one or more Sounder circuits, ON: Sounder circuits Disabled or in Test
Repeater Fault	Yellow	OFF: Repeater is working correctly, ON: Repeater is in the SAFE state (Microcontroller failed)
Repeater PSU Fault	Yellow	OFF: Power supply is healthy, FLASH: PSU fault and/or battery fault
Panel PSU Fault	Yellow	OFF: Panel power supply is healthy, FLASH: Panel PSU has fault or Auxiliary 24Vdc output fuse activated
Earth Fault	Yellow	OFF: No cable faults to Earth, FLASH: One or more cable faults to Earth
Communication Fault	Yellow	OFF: Communication with Panel, FLASH: No communication with Panel
Remote Control Fault	Yellow	OFF: No faults on Remote Control input, FLASH: Fault on Remote Control input
Controls On	Green	OFF: User Controls disabled, ON: User Controls enabled



Zone Location Indications		
Indicator	Colour	Operating Condition
User Zone Location Text	Red	OFF: No Alarm on zone, FLASH: New Alarm on zone, ON: Alarm accepted on zone. NOTE: With Detector/MCP discrimination, the left LED is for Detectors, the right LED for MCPs.
User Zone Location Text	Yellow	OFF: No Fault on zone circuit, FLASH: Fault on zone circuit, ON: Zone circuit Disabled or in Test

10.2 Repeater User Controls



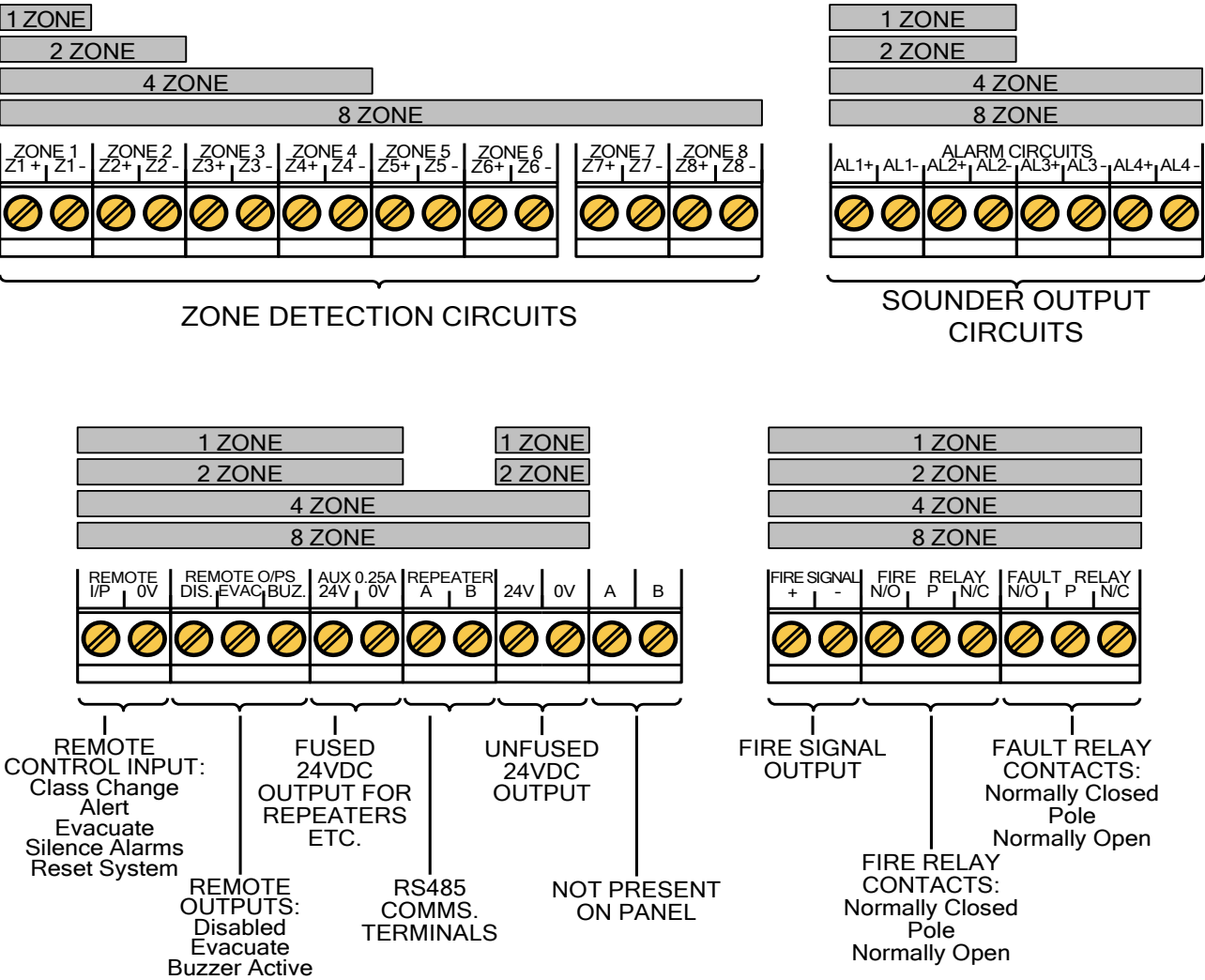
Switch	Functionality	Button Availability
Evacuate	Operates all sounders continuously and illuminates the Alert/Evac On LED until the Silence/Resound Alarms button is operated	When controls are unlocked.
Silence Buzzer	Silences the internal buzzer on the Panel & Repeaters.	When controls are Locked or unlocked
Silence/Resound Alarms	When any sounders are active, press to silence sounders. Press again to resound the silenced sounders.	When controls are unlocked
Reset	Press to clear any fault & alarm conditions and return the panel to the quiescent state	When controls are unlocked
Test	Press to illuminate all LEDs and sound the buzzer for 5 seconds	When controls are locked

11. Circuit Connection Details

11.1 DUO-CEL Panel Motherboard Termination Details

Figure 6 below shows the available field wiring terminals for the DUO-CEL Panel.

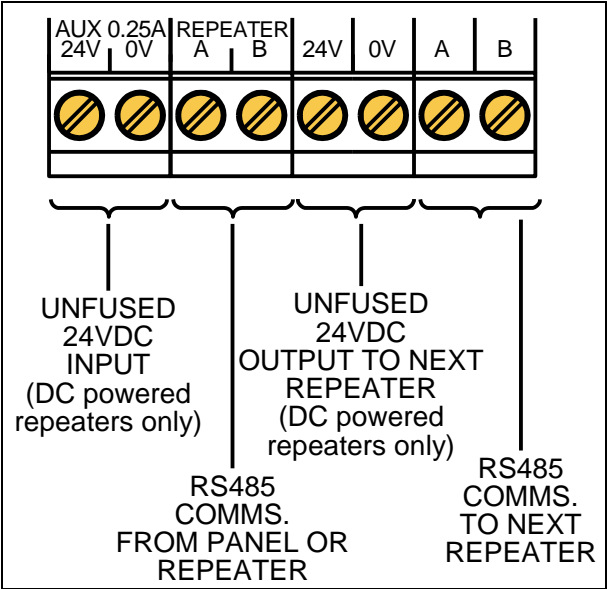
Figure 6 – DUO-CEL Panel field terminations



11.2 DUO-CEL Repeater Motherboard Termination Details

Figure 7 below shows the available field wiring terminals for the DC powered DUO-CEL Repeater. The mains AC powered repeater does not have the two sets of terminals marked 24V & 0V.

Figure 7 – DUO-CEL Repeater field terminations



11.3 Auxiliary Supply

An auxiliary supply is available to power the repeaters and other external field equipment from the panel. This voltage is nominally 27.15VDC but varies with temperature and during mains-failed conditions, depending on battery voltage. See section 14 for details of maximum load.

The output is fused using an electronic device, and fuse activation will be indicated as Fuse Failed on the panel display. The fuse can be reset after clearing the fault by operating the Reset button on the display.

The auxiliary supply terminals are labelled Aux 0.25A 24V and 0V.

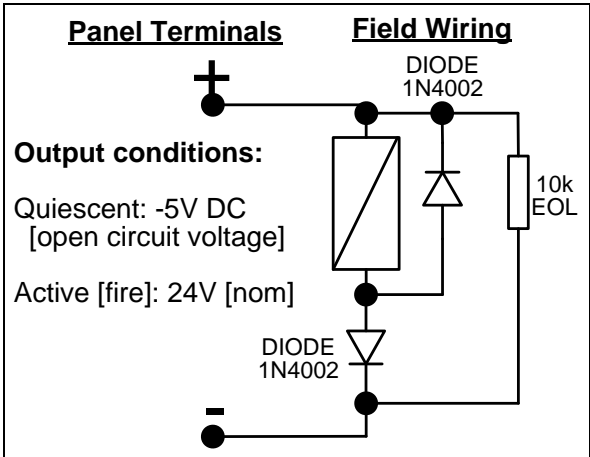
An additional UNFUSED 24V output is provided on repeaters for connection to additional DC powered repeaters.

Note: If equipment draws current from the auxiliary supply during the mains-failed condition this must be included in the battery capacity calculations.

11.4 Fire Signal Output

The Fire Signal output is fault-monitored in the non-energised condition. It is designed to operate a signalling relay at the routing equipment. The Relay coil must be polarised and suppressed, because the 10k end-of-line device is reverse-polarity monitored for open & short circuit faults. See Figure 8 for details.

Figure 8 – Fire Signal Output Connections



11.5 Fire Relay Output

The Fire Relay output is a single pole relay with volt-free change over contacts. The relay is normally de-energised and energises for any fire alarm condition. The relay remains energised until panel reset. This relay will not energise if zone 1 is configured as non-latching and only zone 1 is in alarm. See Figure 9 for details.

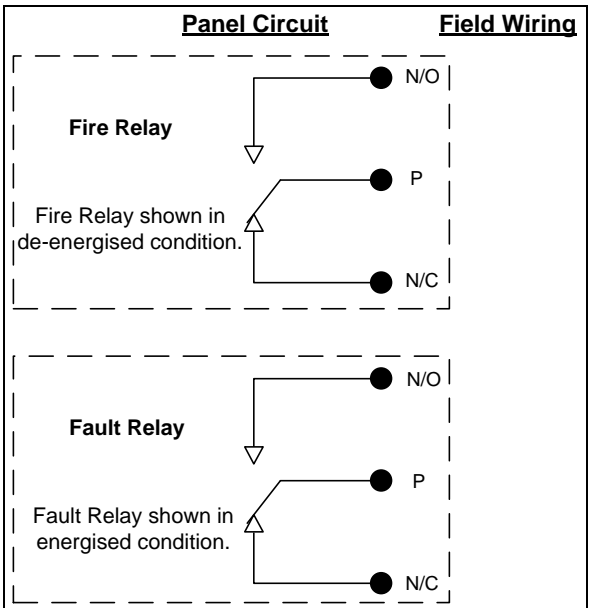
11.6 Fault Relay Output

The Fault Relay output is a single pole relay with volt-free change over contacts. The relay is fail-safe and is therefore normally energised, de-energising for any faults. The marking on the control board terminals is for the energised condition. See Figure 9 for details.

NOTE:

The volt-free relay contacts are rated at 30Vdc with a maximum current of 1A. Do not exceed the rated voltage and current.

Figure 9 – Relay contact connection details



11.7 Remote Control Input

A single 2-terminal input allows remote operation of the following functions:

Control Level	Function	Control Resistor
1	Class Change	4K7
2	Alert	2K2
3	Evacuate	1K
4	Remote Silence Alarms	470R
5	Remote Reset	220R

Control Level 1 is lowest priority, 5 is highest priority.

The input is monitored for open and short circuit faults. Each control level requires a different resistor load as shown in the above table. A 10K resistor acts as the end-of-line device for fault monitoring. See Figure 10 for wiring details.

11.7.1 Class Change

The Class Change function allows all sounder circuits to be operated for a maximum of 5 seconds. When the Class Change control resistor is applied, the sounders will operate continuously and then automatically silence after 5 seconds. No indications will be given on the panel. The resistor needs to be removed and applied again if the signal needs to be repeated.

11.7.2 Alert

The Alert function allows all sounder circuits to be operated in pulsing mode.

When the Alert resistor is applied, the sounders will pulse until the resistor is removed. The Alert/Evac On LED will illuminate on the panel and the internal buzzer will sound.

11.7.3 Evacuate

The Evacuate function allows all sounder circuits to be operated in continuous mode.

When the Evacuate resistor is applied, the sounders will operate continuously until the resistor is removed. The Alert/Evac On LED will illuminate on the panel and the internal buzzer will sound. The Evacuate output will also operate.

11.7.4 Silence Alarms

The Silence Alarms function allows all active sounder circuits to be deactivated.

When the Silence Alarms resistor is applied, any active sounder circuits will be deactivated. The Silence Alarms function is momentary and the resistor needs to be removed and applied again in order to re-operate the Silence Alarms function.

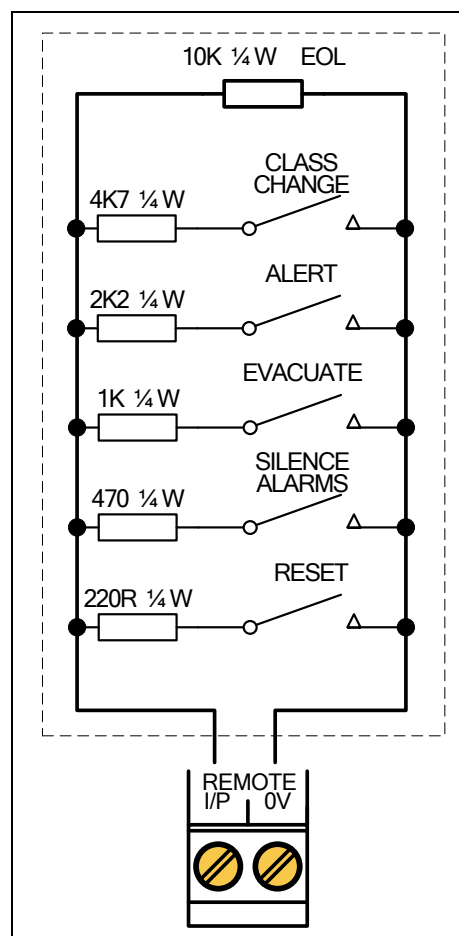
11.7.5 Reset

The Reset function allows all standing alarms and

faults to be cleared, returning the panel to the quiescent state. The Auxiliary 24VDC supply may also be switched off for 10 seconds if configured to do so.

When the Reset resistor is applied with the panel in the fire alarm condition, any active sounder circuits will be deactivated, all zone circuits will reset the detectors, the fire relay will de-energise, the fault relay will deactivate and all fire and fault indications will clear. The Reset function is momentary and the resistor needs to be removed and applied again in order to re-operate the Reset function.

Figure 10 – Remote Control I/P connections



Note:

To prevent unauthorised operation of the system, any manually operated function must be operated by a key-switch. The key to the switch should be held with the panel's access control key.

For the SILENCE ALARMS and RESET functions, the Keyswitch should be spring-biased so that it automatically returns to the off position when released.

11.8 Open Collector Outputs

Three open collector outputs are provided:

1. Disabled (DIS.)
2. Evacuate (EVAC.)
3. Buzzer Active (BUZ.)

They are referred to as 'open collector' because each output is connected to the open collector pin of a transistor.

In the deactivated state, each open collector output is floating and is effectively open circuit. When the output is activated, the transistor allows current to flow from the open collector pin down to 0V. Each output is able to sink 50mA when active. Higher currents will damage the transistor driver.

If the output is used to drive a relay then a suppression diode should be used across the relay coil to avoid damaging the output driver circuit.

11.8.1 Disabled Output

The Disabled output is activated when any disablements exist on the panel. The only exceptions are Buzzer Disable and Earth Fault Disable, both of which produce no indications on the panel.

11.8.2 Evacuate Output

The Evacuate output is activated when the panel is in the Evacuate state, either due to the button on the display or due to the Remote Control input.

11.8.3 Buzzer Active Output

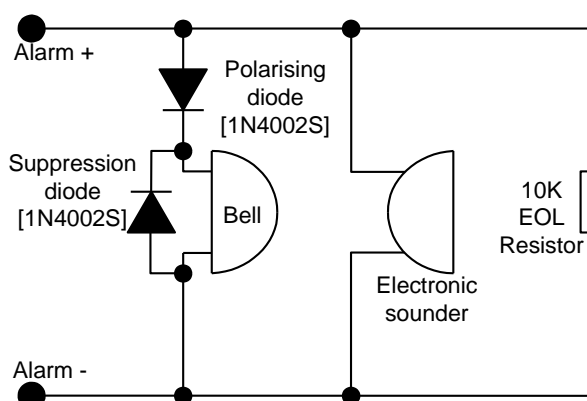
The Buzzer Active output duplicates the panel buzzer for alarm and fault conditions. It does not operate for button presses.

11.9 Sounder Circuits

The DUO-CEL panel has up to 4 standard sounder circuits, each rated at 0.5 Amps (not including twin-wire sounders). The circuits are reverse polarity monitored for open and short circuit faults. All connected field devices must be polarised to allow correct fault monitoring. To prevent damage to the control panel, any solenoid devices such as bells must also have a suppression diode fitted as shown in Figure 11.

The circuit must be terminated with a 10K end of line resistor.

Figure 11 – Alarm circuit configuration



The voltage drop on each alarm circuit should be calculated to ensure that the minimum voltage at

the end of each circuit exceeds the minimum required by each sounding device.

The voltage at the end of the circuit is given by the following calculation:

$$V_{almin} = V_{opmin} - (I_{al} \times 2 \times L_{al} \times R_{cable})$$

V_{almin} = Minimum Alarm Voltage (V)

V_{opmin} = Minimum Output Voltage (19.5V)

I_{al} = Alarm Current (A)

L_{al} = Alarm Circuit length (M)

R_{cable} = Cable Resistance per metre (Ω)

1.5mm² – 0.015 Ω per metre per core

2.5mm² – 0.009 Ω per metre per core

11.10 Electrical Design of Detection Zones

To allow the panel to correctly monitor for fault conditions, the wiring for each zone must be installed as a continuous pair with no spurs or tees. The end-of-line monitoring device will depend on the type of panel. Correct polarity must be strictly observed throughout.

11.10.1 Standard Panel Default Zone Configuration

The standard panel zone configuration (factory Default) uses active fault monitoring, with a 10uF capacitor as the EOL device (see Figure 13).

11.10.2 Standard Panel Resistor Zone Configuration

The standard panel can be set to resistor zone configuration (set by DIL switch). This uses passive fault monitoring, with a 6K8 to 3K9 resistor as the EOL device (see Figure 14).

11.10.3 Twin-Wire Panel

The Twin-Wire panel uses passive fault monitoring but with an EOL device consisting of a zener diode and resistor as shown in Figure 12. The device is polarised and should not be connected in reverse (otherwise the panel will indicate an alarm condition). This EOL device allows monitoring for detector head removal whilst maintaining line continuity via diodes fitted to detector bases.

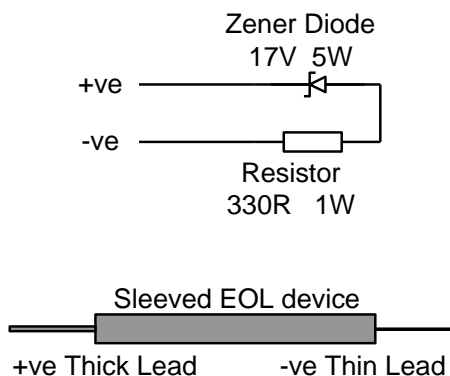
The addition of the zener and resistor enables the twin-wire sounders to operate, even with one detector removed.

Only use detector bases with line continuity diodes fitted.

DO NOT leave any diode bases empty. Detectors should be fitted or a blanking plate which links out the diode should be fitted.

NOTE: The twin-wire EOL will draw up to 4mA from the zone in quiescent and this should therefore be added to the total zone current when calculating the standby battery requirements.

Figure 12 – Twin-Wire EOL device



Connect bare leads to + & - terminals in last zone device

11.10.4 Maximum Number of Detectors/MCPs on a Zone

For the standard panel with 10uF EOL capacitor, the maximum number of detectors & MCPs per zone is limited to 32.

For the standard panel with EOL resistor, the maximum number of devices allowed on a zone is limited by the quiescent current drawn by each device. The quiescent current will be listed on the device data sheet provided by the Manufacturer of the device. See section 7.1 for details.

The maximum quiescent current available to power devices on a zone is 1.6mA. Exceeding this value will prevent the panel from correctly monitoring for open circuit fault conditions.

For the Twin-Wire panel the maximum number of detectors & MCPs per zone is limited to 16 (or less, see section 7.1) if sounders are also connected. If no twin-wire sounders are on the zone then up to 30 detectors & MCPs may be connected (see section 7.1 for details). The maximum number of twin-wire sounders permitted is 12 (or less; see section 7.1).

Note: It is a recommendation of BSEN 54-2 that there should be no more than 32 detectors & MCPs in a zone.

Figure 13 – Standard Zone Wiring Diagram

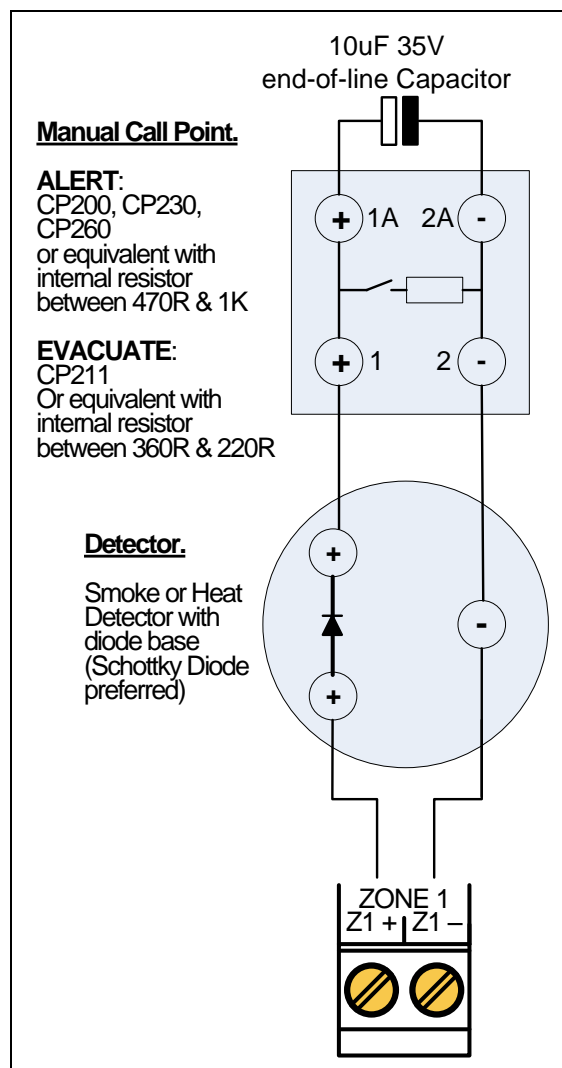


Figure 14 – Resistor EOL Zone Wiring Diagram

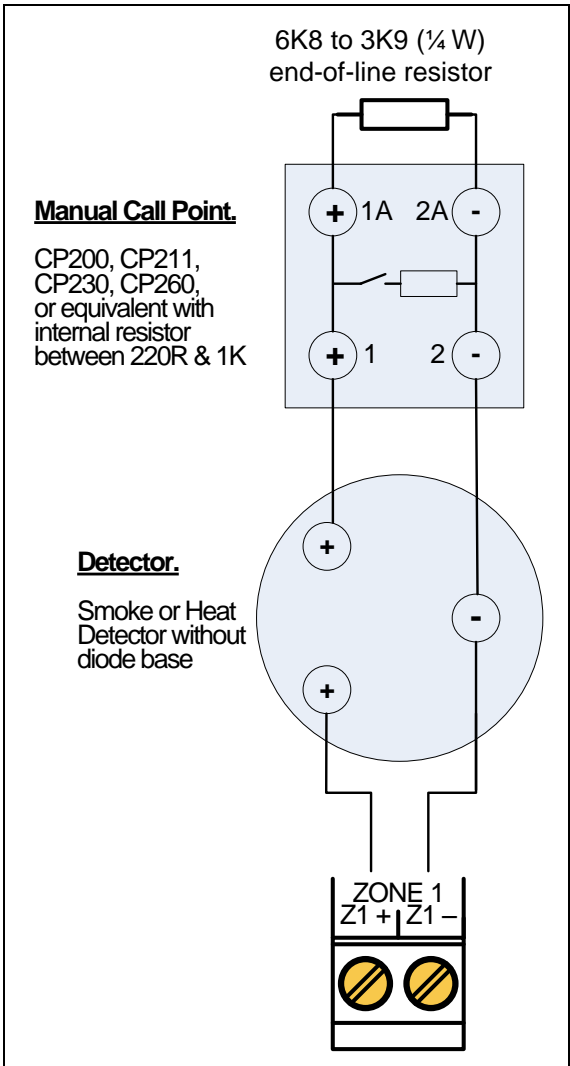


Figure 15 – Twin-Wire Zone Wiring Diagram

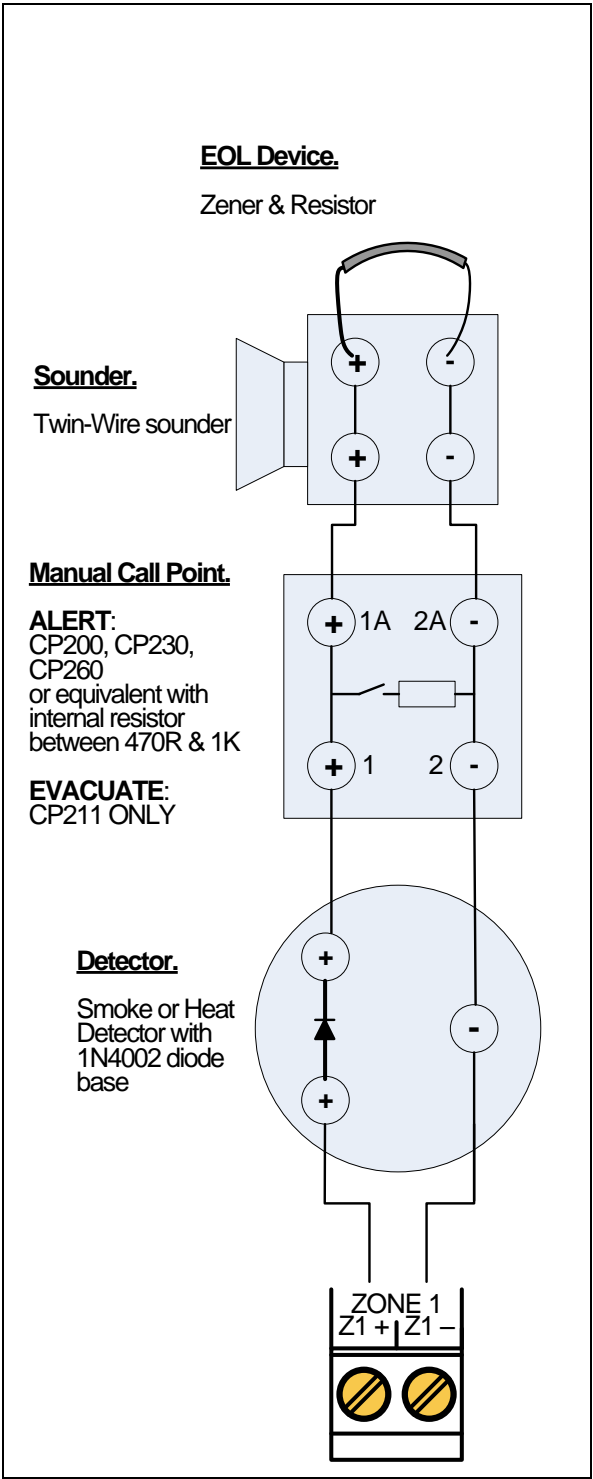


Figure 16 – Alarm Circuit Wiring Diagram

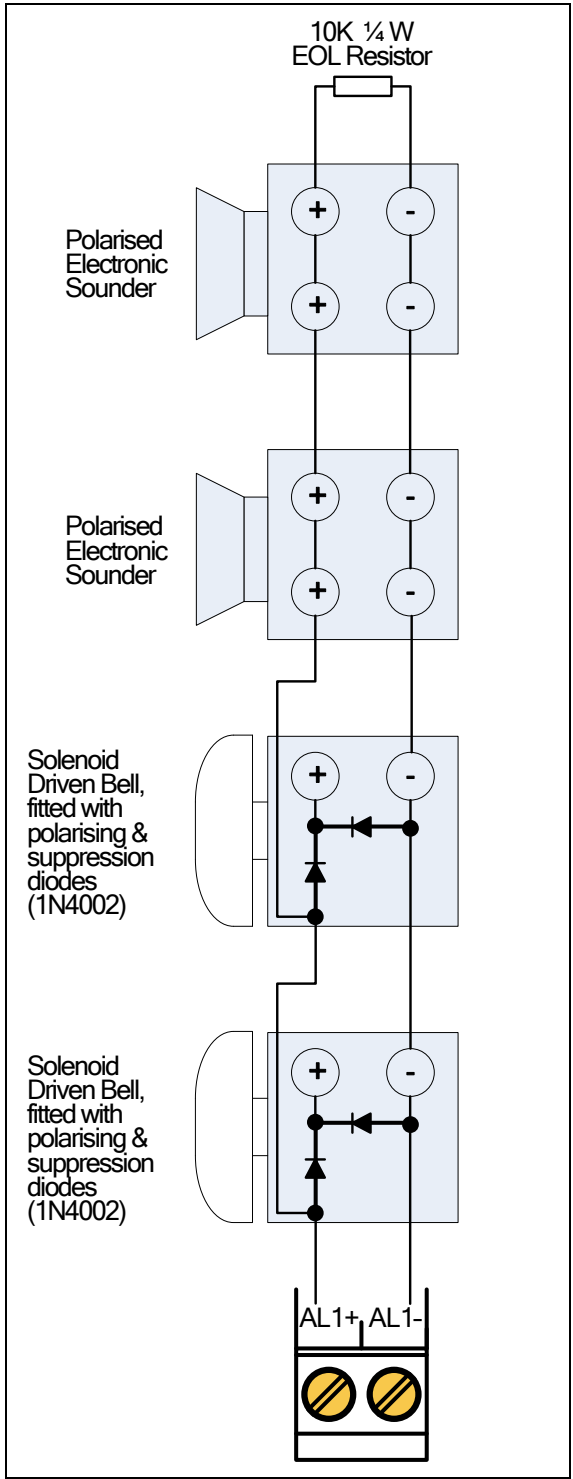
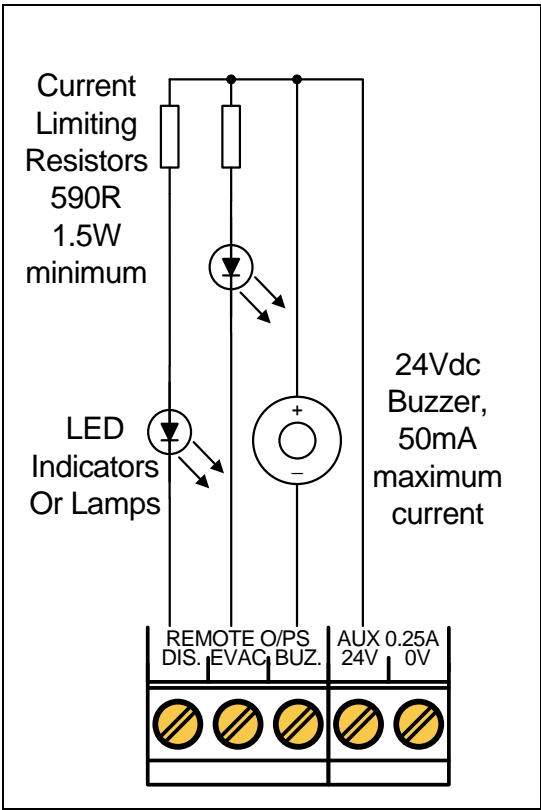


Figure 17 – Remote Indicators Wiring Diagram

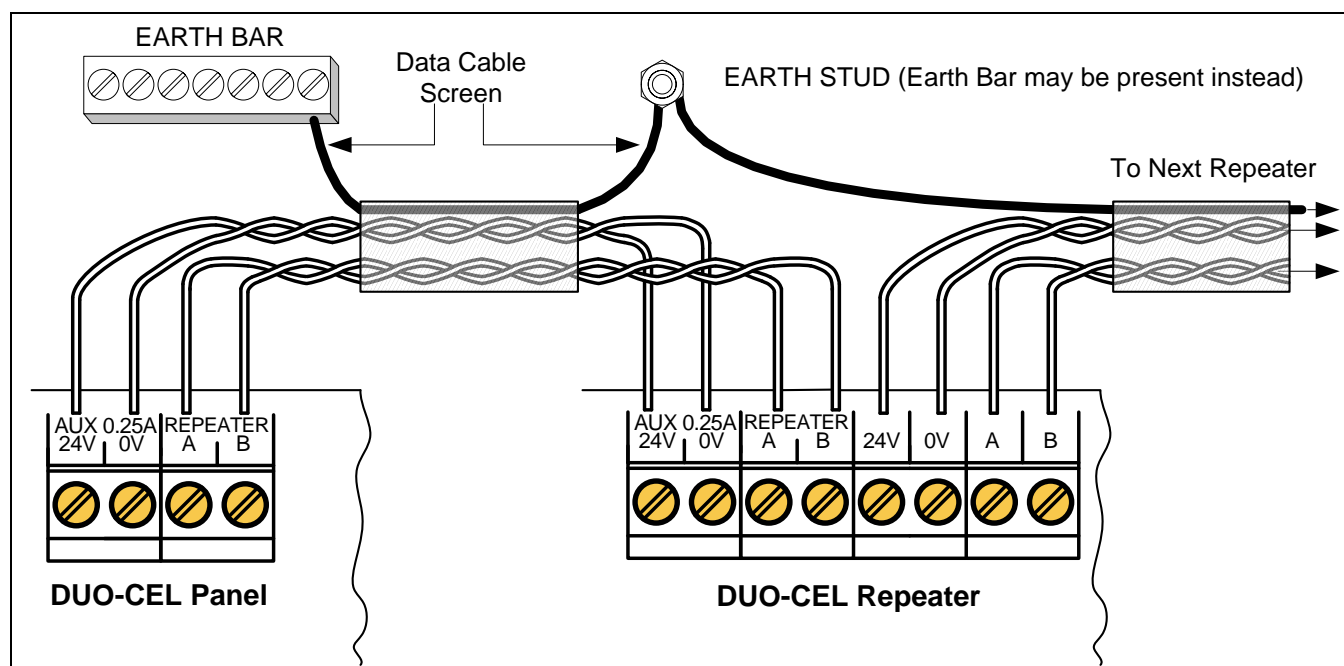


NOTE: The Alarm circuit terminals are marked for the active polarity. When in quiescent monitoring mode, the alarm circuit is monitored in the reverse polarity (hence the requirement for a polarising diode).

If the cable includes a screen then this should be earthed at the panel & all repeaters.

Terminal A at the panel must be connected to Terminal A at all repeaters, Terminal B at the panel must be connected to Terminal B at all repeaters.

Figure 18 – Repeater Wiring Diagram



EQUIPMENT: **FIRECLASS DUO-CEL**

WRITTEN BY: RKP

PUBLICATION: OM_DUO-CEL_APP

CHECKED BY: AP

ISSUE No. & DATE: 0 01/03/12

12. Mechanical & Electrical Specification

Mechanical Specification	Panel	Repeater c/w PSU
Size (mm) HxWxD	273 x 365 x 110	273 x 365 x 110
Weight excluding batteries (kg)	2.2	2.2

Bentel Power Supply Specification	Panel	Repeater c/w PSU
Mains Input	230Vac	230Vac
Maximum Input Power	138W	138W
Protection	3A 250V	3A 250V
[NOT USER SERVICEABLE]	20mm Glass Fuse	20mm Glass Fuse
Input Voltage	230Vac +10% -15%	230Vac +10% -15%
Mains Frequency [Hz]	47.5 – 63	47.5 – 63
Output Voltage (Nominal)	27.15Vdc ±1%	27.15Vdc ±1%
Output Voltage Adjustment	Factory Set	
Output Protection	Electronic current limiting	
Cable requirements	Minimum of 1mm ² CSA copper protected by a 5A fuse.	

Panel Integrated Power Supply Output Specification		
Maximum Short Term Output Current (I max b)	1.4A	No Output
Maximum Continuous Output Current (I max a)	335mA	No Output
Minimum Output Current (I min)	29mA	No Output
DC Voltage output, Mains On	27.15V Nominal (26.4V-28.4V)	No Output
Maximum Output current, Mains Failed	1.4A	No Output
DC Voltage Output, Mains Failed	27V-20V	No Output
Output Protection	Electronic current limiting	No Output
Maximum ripple including switching spikes (full load, battery disconnected)	540mV	No Output
Output Voltage Adjustment	Factory Set (Via Bentel Power Supply)	No Output

Battery Specification	Panel	Repeater c/w PSU
Battery charger output: Temperature compensated float charger 28.15V ±0.1V@ -10°C, 26.6V ±0.1V@ +55 °C.	1.5A	1.5A
Battery type: POWERSONIC [Warning: Replace only with identical battery]	2 off PS-1230 [12V 3.4Ah]	2 off PS-1230 [12V 3.4Ah]
Battery capacity	Based on 24 hours stand-by.	
Battery circuit protection: [Warning: Replace only with identical type & rating of fuse]	F2AL250V 20mm fast blow glass fuse	F2AL250V 20mm fast blow glass fuse
Mains failed battery current (not including zone & alarm devices)		
Panel	Standby (mA)	Alarm (mA)
1 Zone standard	21	60
2 Zone standard	23	63
4 Zone standard	28	76
8 Zone standard	36	84
1 Zone Twin-Wire	25	64
2 Zone Twin-Wire	31	72
4 Zone Twin-Wire	44	100
8 Zone Twin-Wire	70	130
DC powered Repeater	8	13
Mains Powered Repeater	17	22

EQUIPMENT: **FIRECLASS DUO-CEL**

WRITTEN BY: RKP

PUBLICATION: OM_DUO-CEL_APP

CHECKED BY: AP

ISSUE No. & DATE: 0 01/03/12

13. Environmental Specification

Environmental Specification	
Ingress Protection Rating	IP 30
Panel operating ambient temperature range	-5°C to +40°C
Storage temperature range	-10°C to + 70°C
Operating and storage humidity	95% Non condensing
Max operational vibration	Frequency range: 10 Hz to 150 Hz – acceleration amplitude: 0.1g.
Electromagnetic Compatibility	Mains Supply Voltage Variations: BSEN 50130-4: 1996 Mains Supply Voltage Dips and Interruptions: BSEN 50130-4: 1996 EMC Radiated Immunity: BSEN 50130-4: 1996 [Amd 1 & 2] clause 10 ESD: BSEN 50130-4: 1996 [Amd 1 & 2] clause 9 Fast Transient Burst: BSEN 50130-4: 1996 [Amd 1 & 2] clause 12 Surge: BSEN 50130-4: 1996 [Amd 1 & 2] clause 13 Conducted Immunity: BSEN 50130-4: 1996 [Amd 1 & 2] clause 11 Conducted Emissions: BSEN61000-6-3: 2007 Radiated Emissions: BSEN61000-6-3: 2007

14. DUO-CEL Input and Output Specification

<u>Detection Zone Inputs</u>	
Operating Details	<p>Active open circuit & Head Removal monitoring, with optional conventional open circuit fault monitoring. Conventional short circuit fault monitoring. Conventional Fire Alarm monitoring with optional Detector/MCP discrimination.</p> <p>Monitoring Threshold current Short circuit threshold: $\geq 37.8\text{mA}$. ($\leq 60\text{R}$)</p> <p>Evacuate Manual Call Point alarm threshold: $\geq 22.8\text{mA}$, $<37.8\text{mA}$. ($\geq 60\text{R}$, $\leq 410\text{R}$)</p> <p>Detector/Alert Manual Call Point alarm threshold: $\geq 11.7\text{mA}$, $<22.8\text{mA}$. ($\geq 410\text{R}$, $\leq 1\text{k}$)</p> <p>Quiescent: $\geq 2.2\text{mA}$, $<11.7\text{mA}$. ($\geq 1\text{k}$, $\leq 8\text{k}$)</p> <p>Open circuit (resistor EOL or Twin-Wire): $< 2.2\text{mA}$. ($\geq 8\text{k}$)</p>
Cable requirements	Maximum cable resistance of circuit loop: 7.5 Ohms.

<u>Ancillary Inputs</u>	
Remote Control Input	<p>Class Change: 4k7 Alert: 2k2 Evacuate: 1k Silence Alarms: 470R Reset: 220R</p> <p>End-Of-Line: 10k</p> <p>All resistors are ¼W 5% tolerance</p> <p>Maximum cable resistance of circuit loop 20 Ohms</p>
Earth Fault I/P	Fault threshold varies for each circuit, from 10k to 70k between Earth and +ve or -ve line

<u>Outputs</u>	
Evacuate Activated	Open collector. 50mA 30V maximum current sink
Buzzer Activated	Open collector. 50mA 30V maximum current sink
Disabled	Open collector. 50mA 30V maximum current sink
Fire Signal Output Fault Monitored	Quiescent: -2.6Vdc (10k EOL present, reverse polarity monitored) Active (fire alarm): 24Vdc [nominal]
Fire Relay (Not Fault Monitored)	Volt-free Relay contacts, normally de-energised. Contact Rating: 1A 30Vdc
Fault Relay (Not Fault Monitored)	Volt-free Relay contacts, normally energised. Contact Rating: 1A 30Vdc

<u>Alarm Circuits</u>	1-Zone	2-Zone	4-Zone	8-Zone
Quantity	2	2	4	4
Maximum Current per circuit [Amps]	0.5	0.5	0.5	0.5
Output Voltage (battery operation) [Volts DC]	27 – 20 (dependent on battery condition)			
Output Voltage (mains operation) [Volts DC]	28.4 – 26.4 (dependent on temperature)			
Fault Monitoring	End-Of-Line resistor 10k Reverse polarity monitored for open and short circuit faults			
Protection [Self resetting electronic] [Amps]	0.7	0.7	0.7	0.7
Cable requirements	Cable resistance and current load must allow a voltage at the end-of-line which is above the minimum operating voltage of the sounders.			

EQUIPMENT: **FIRECLASS DUO-CEL**

WRITTEN BY: RKP

PUBLICATION: OM_DUO-CEL_APP

CHECKED BY: AP

ISSUE No. & DATE: 0 01/03/12

<u>Auxiliary Supply</u>	
Maximum Current [Amps]	0.25
Auxiliary supply (battery operation) [Volts DC]	27 – 20 (dependent on battery condition)
Auxiliary supply (mains operation) [Volts DC]	28.4 – 26.4 (dependent on temperature)
Protection [Electronic] [Amps]	0.4
Cable requirements	Cable resistance and current load must allow a voltage at the end-of-line which is above the minimum operating voltage of the equipment connected.

<u>Repeater Output</u>	
Number of repeaters	1 to 3
Maximum panel to repeater cable length	1200m
Communication protocol	RS485 serial data
Protection	Electronic, current limited
Cable Type	See Below

RS485 Cable Specification	
Generic Type	RS422/RS485 data cable.
Conductors	Two pairs
Alpha cable	57602, 58412, 57632, 58802, 58902 PLENUM RATED
Belden cable	82842, 89842, 88777 PLENUM RATED

15. Appendix

15.1 EN54 Mandatory Functions

The DUO-CEL panel provides the following EN54-2 mandatory functions:

- Clause 5.1 Display of functional conditions.
- Clause 5.2 Display of indications.
- Clause 5.4 Indication of the supply of power.
- Clause 5.5 Audible indications.
- Clause 5.6 Additional indications.
- Clause 7.1 Reception and processing of fire signals.
- Clause 7.2 Indication of the fire alarm condition.
- Clause 7.3 Indication of the zones in alarm.
- Clause 7.4 Audible indication (of fire alarm).
- Clause 7.6 Reset from the fire alarm condition.
- Clause 7.7 Output of the fire alarm condition.
- Clause 8.1 Reception and processing of fault signals.
- Clause 8.2 Indication of faults in specified functions.
- Clause 8.5 System Fault
- Clause 8.6 Audible Indication (of faults).
- Clause 8.7 Reset of fault indications.
- Clause 8.8 Fault output.
- Clause 9 Disabled condition

15.2 EN54 Optional Functions With Requirements

The DUO-CEL panel provides the following EN54-2 optional functions:

- Clause 7.8 Outputs to fire alarm devices.
- Clause 7.9 Outputs to fire alarm routing equipment.
- Clause 7.12 Dependencies on more than

one alarm signal.

- Clause 7.13 Alarm counter
- Clause 10 Test condition.

15.3 Ancillary Functions Not Required By EN54

The DUO-CEL panel offers several auxiliary functions that are not required by EN54-2 (some may affect the mandatory functions). These are:

- Fire Relay output.
- Detection zone 1 can be configured as non-latching. (AFFECTS A MANDATORY FUNCTION).
- Remote control input for class change, alert, evacuate, silence alarms & reset.
- Auxiliary 24Vdc supply reset to interrupt power to external equipment that needs to be reset in tandem with the DUO-CEL panel (e.g. IR Beam Detectors).
- Disable the panel buzzer. (AFFECTS A MANDATORY FUNCTION).
- Open collector outputs for disabled, evacuate active & buzzer active.
- One Man Sounder Test [see 8.6].
- Repeater panels.

15.4 Safe State

The microcontroller in the DUO-CEL panel continuously monitors the firmware memory, the volatile memory and the configuration memory for corruption. If an error is detected, the software enters the safe state. In addition, a hardware circuit monitors the microcontroller for correct operation. This hardware watchdog circuit will also place the panel in the safe state if the microcontroller fails to work correctly.

In the safe state, all outputs are deactivated and only the SUPPLY ON, GENERAL FAULT & SYSTEM FAULT LEDs are illuminated. The buzzer will sound continuously.

15.5 Power Supply Load Calculation

The power supply load must not exceed 1.5 Amps.

To determine the maximum power supply load perform the following steps:

1. Look-up the mains failed panel load in alarm. Enter this value as I_{panel} .
2. Calculate the maximum load on the alarm circuits in mA in an alarm condition. Enter this value as I_{alarms} .
3. Calculate the load on the auxiliary supply in mA in an alarm condition. Enter this value as I_{aux} .
4. Calculate the maximum power supply load using the formula below:

$$I_{\text{panel}} = \text{_____ mA}$$

$$I_{\text{alarms}} = \text{_____ mA}$$

$$I_{\text{aux}} = \text{_____ mA}$$

$$\begin{aligned} I_{\text{pse}} &= (I_{\text{panel}} + I_{\text{aux}} + I_{\text{alarms}})/1000 \text{ Amps} \\ &= \frac{\text{_____}}{\text{_____}} + \frac{\text{_____}}{\text{_____}} + \frac{\text{_____}}{\text{_____}})/1000 \text{ Amps} \\ &= (\text{_____})/1000 \text{ Amps} \\ &= \text{_____ Amps} \end{aligned}$$

Warning:

The value of I_{pse} must not exceed the maximum permissible load for the panel. Overloading the power supply may result in automatic shutdown of the power supply during a fire alarm condition.

15.6 Minimum Standby Battery Capacity Calculation

This section describes how to calculate the minimum required standby battery capacity for the control panel. To determine the battery capacity, perform the following steps:

1. Look-up the mains failed fault battery current. Add the zone current for each zone (detectors, sounders & EOL). Enter this value as $I_{\text{panel fault}}$.
2. Look-up the mains failed alarm battery current. Add the zone current for each zone (detectors, sounders & EOL). Enter this value as $I_{\text{panel alarm}}$.
3. Calculate the maximum load on the alarm circuits in mA in an alarm condition. Enter this value as I_{alarms} and enter this figure in the table.
4. Calculate the load on the auxiliary supply in mA in the quiescent condition. Enter this value as $I_{\text{aux fault}}$.
5. Calculate the load on the auxiliary supply in mA in an alarm condition. Enter this value as $I_{\text{aux alarm}}$.
6. Calculate the total battery load in fault, I_{fault} .
7. Calculate the total battery load in alarm, I_{alarm} .
8. Enter the required standby time in hours, T_{fault} .
9. Enter the required time in alarm in hours, T_{alarm} .

$$I_{\text{panelfault}} = \underline{\hspace{2cm}} \text{ mA}$$

$$I_{\text{auxfault}} = \underline{\hspace{2cm}} \text{ mA}$$

$$I_{\text{fault}} = [I_{\text{panelfault}} + I_{\text{auxfault}}] \underline{\hspace{2cm}} \text{ mA}$$

$$T_{\text{fault}} = \underline{\hspace{2cm}} \text{ hrs}$$

$$I_{\text{panelalarm}} = \underline{\hspace{2cm}} \text{ mA}$$

$$I_{\text{alarms}} = \underline{\hspace{2cm}} \text{ mA}$$

$$I_{\text{auxalarm}} = \underline{\hspace{2cm}} \text{ mA}$$

$$I_{\text{alarm}} = [I_{\text{panelalarm}} + I_{\text{alarms}} + I_{\text{auxalarm}}] = \underline{\hspace{2cm}} \text{ mA}$$

$$T_{\text{alarm}} = \underline{\hspace{2cm}} \text{ hrs}$$

10. Substitute the values in to the formula below.

The MINIMUM battery capacity (C_{min}) required is given by:

$$\begin{aligned} C_{\text{min}} &= 1.25 \times ((T_{\text{fault}} \times I_{\text{fault}}) + (2 \times (T_{\text{alarm}} \times I_{\text{alarm}})))/1000 \text{ Ah} \\ &= 1.25 \times (\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} + (2 \times (\underline{\hspace{1cm}} + \underline{\hspace{1cm}})))/1000 \text{ Ah} \\ &= 1.25 \times ((\underline{\hspace{1cm}} + (2 \times (\underline{\hspace{1cm}})))/1000 \text{ Ah} \\ &= 1.25 \times (\underline{\hspace{1cm}})/1000 \text{ Ah} \\ &= 1.25 \times \underline{\hspace{1cm}}/1000 \text{ Ah} \\ &= \underline{\hspace{1cm}}/1000 \text{ Ah} \\ C_{\text{min}} &= \underline{\hspace{1cm}} \text{ Ah} \end{aligned}$$

11. Select the next **highest** available battery size.

A battery Calculation worksheet is included on the next page.

Notes:

1. The DUO-CEL panel is designed to house and charge POWERSONIC 3.4Ah batteries to 80% capacity in 24 hours.
2. Any batteries that cannot be accommodated within the DUO-CEL enclosure must be located in an enclosure adjacent to the DUO-CEL.

EQUIPMENT: **FIRECLASS DUO-CEL**

WRITTEN BY: RKP

PUBLICATION: OM_DUO-CEL_APP

CHECKED BY: AP

ISSUE No. & DATE: 0 01/03/12

15.6.1 Standby Battery Capacity Calculation Worksheet

Equipment	Quantity	Mains Failed Current (each) (mA)	Total Mains Failed Current (mA)		Alarm Current (each) (mA)	Total Alarm Current (mA)
DUO-CEL Panel type						
1 Zone Panel						
2 Zone Panel						
4 Zone Panel						
8 Zone Panel						
Optional equipment connected to 24Vdc outputs						
Repeater						
2-Wire Sounders on zones						
Symphoni		0.05			5	
Squashni		0.05			5	
SQG3/SDR		0.05			5	
SQG3/AV		0.05			5	
Conventional Sounders on sounder circuits						
Bedlam		0			30	
Banshee		0			17	
Detectors on zones						
Tyco M600 Series						
Apollo Series 65						
Apollo Orbis						
Resistor EOL – 6K8		2.9			2.9	
Resistor EOL – 3K9		4.8			4.8	
Twin-Wire EOL		3.8			12	
Other Outputs						
Fire Signal		N/A	N/A			
TOTAL =				TOTAL (1.5A max) =		

	x		x
Standby Time (h)		Alarm Time (h)	
Standby Capacity (mAh)		Alarm Capacity (mAh)	
Total Capacity = Standby + (2 x Alarm) mAh			
Convert to Ah (÷ 1000)			
Allow for Aging (x 1.25)		x 1.25	
Required Battery Capacity (Ah)			
Next Highest Battery Size Available (PowerSonic Only)			

15.7 A1466 Interface Relay

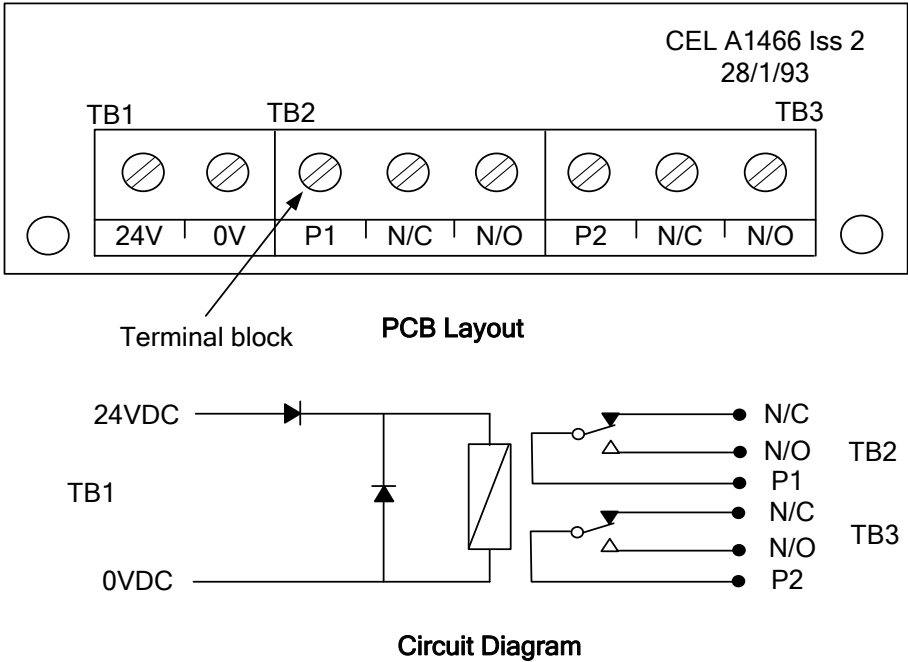
The A1466 Interface Relay board is available as an optional item.

This relay is compatible with the Fire Signal Output on the DUO-CEL panel. It provides two sets of volt-free normally open & normally closed contacts.

Polarity and suppression diodes are also mounted on the board.

The A1466 board should be mounted inside the equipment to be controlled by the Fire Signal output. The 10K EOL resistor should be connected across the 24V & 0V terminals of the A1466 board..

Figure 19 – A1466 Interface Relay Specification



Specification

Terminals

Max conductor: 2.5mm.

24V, 0V: Relay coil connections - observe polarity .

P1: Relay contact 1 pole.

N/C: Relay contact 1 normally closed.

N/O: Relay contact 1 normally open.

P2: Relay contact 2 pole.

N/C: Relay contact 2 normally closed.

N/O: Relay contact 2 normally open.

Ratings

Coil: Operating voltage range: 17.5 to 30VDC.

Operating current: 8mA at 24VDC.

Resistance: 2900 Ohms.

Relay contacts: 2A at 30VDC

Warning - Do not exceed the rated voltage or current.

Dimensions

Board size: 30mm x 45mm.

Height: 15mm.

Fixing centres: 24mm x 30mm

Fixing hole sizes: M4 clearance.

Installation

Must be installed within enclosure of the equipment being controlled.

Environmental: Clean, dry location not subject to excessive vibration or shock.

Temperature: -10 to +70 deg C

15.8 Panel Configuration Design Chart

Table 3 – DUO-CEL Panel DIL Switch Configuration Design/Record





















Switch	Function	Position	Actual Setting
1	Zone 1 Latching Fire Alarm Indication	Off 	
	Zone 1 Non-latching Fire Alarm Indication	On 	
2	Active fault monitoring on zones (10uF capacitor EOL)	Off 	
	Passive fault monitoring on zones (3K9 to 6K8 resistor EOL) (See also DIL switch 3 operation)	On 	
3	Normal Sounder operation	Off 	
	Alert Sounder operation	On 	
4	Dependency (coincidence) Configuration mode disabled.	Off 	Table 4
	Zones can be configured dependency (coincidence) mode	On 	
5	General Alarms sounder operation	Off 	
	Zonal Alarms sounder operation	On 	
6	Short Circuit Fault monitoring on zones	Off 	
	No Short Circuit Fault Monitoring on zones (S/C = Fire Alarm)	On 	
7	Auxiliary 24Vdc output is always switched on	Off 	
	Auxiliary 24Vdc output turns off briefly during panel reset.	On 	
8	Internal Buzzer operates for Fires & Faults	Off 	
	Internal buzzer does not operate for Fires & Faults	On 	
9	Repeater Configuration mode disabled.	Off 	No. _____
	Repeater Configuration mode active.	On 	
10	Sounder Expansion Board Not Fitted (8-zone panel only)	Off 	NOT USED
	Sounder Expansion Board Fitted (8-zone panel only)	On 	
11	NOT USED	N/A	N/A
12	NOT USED	N/A	N/A

Table 4 – Zone Dependency Configuration Design/Record

Zone Number	Dependency (YES/NO)
1	
2	
3	
4	
5	
6	
7	
8	

16. General Assembly Drawing

